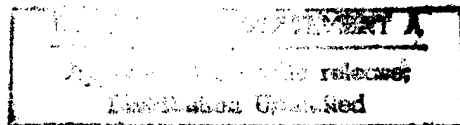013020

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China Report

SCIENCE AND TECHNOLOGY

No. 179

COMPUTER DEVELOPMENT AND APPLICATIONS

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CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 179

COMPUTER DEVELOPMENT AND APPLICATIONS

CONTENTS

COMPUTER DEVELOPMENT IN CHINA REVIEWED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 2, 28 Jan 81, pp 1,2

[Article by Wang Jiayun [3076 1367 0061] of Huabei Computing Research Institute: "General Review of Our Country's Computer Technology and Enterprise (Part One)"]

[Text] Our country is way behind the industrially developed nations of the West as far as its capital investments in electronics industry and the proportion of investments in computer industry to electronics industry are concerned. In China, the industrial output value is less than one-thousandth of the gross national product. At present, computers are placed high on China's list of priority projects as one of the eight major comprehensive sciences and technologies which will bear influence on the overall situation. Special attention is being attached to the development of computers, which is a wise and bold decision of strategic importance.

Computing Technology

Development of China's computing technology began in 1956 and has gone through three generations of transformations. The early period, i.e., the electronic tube computer stage, was very short, most of which was spent on imitating Soviet M-3 and BESM-4 machines: programming was mostly wired by hand, and research was mainly based on the Soviet symbolic operator system. Very few products were produced during this period, and the machines were made obsolete in no time following the emergence of transistorized computers. Transistorized machines were first developed in 1960, and put on the production line in 1964, thus giving birth to the second generation. During this stage, most of the designing work was carried out on our own; software development included assemblers, supervisors and checking programs; research and applications gradually shifted towards such high-level algorithmic languages as ALGOL and BASIC. Through 6-7 years of practice, our country managed to foster a contingent of young, competent and experienced computer researchers and developers. Moreover, key research institutes gradually formed their own style and characteristics in design and application. The Academy of Sciences and institutions of higher education advanced ahead of the industrial sector in the realm of theoretical and applicative research. Transistorized computers opened up the frontier for the commercial production and extensive use of computers in our country, and greatly contributed to the building of China's national economy and national defense. At present, the large number of transistor computers are still operating. The

earliest product was 109.B; typical products include DJS06, 441BIII, X-2 and DJS121. As the immense importance and value of software heredity came to light, beginning in 1973, our computer technology moved into the third generation stage characterized by serialization and integration circuits. Through coordinative efforts among various research organizations, schools of higher education and factories which surmounted one difficulty after another, the DJS100, DJS180 minicomputer series followed by DJS200 medium/large frame computer series appeared in the domestic computer market in the late 1970's. Other notable machines of the same period include TQ-16, etc. These series have incorporated the merits of corresponding foreign-made series which are characterized by matured technology, good assortment of software, and extensive application. Excellent results have been achieved in applications with the DJS100 series which was designed in accordance with the actual conditions in our country and the first of its kind to enter the market. During this stage, software work focused mainly on the development and application of real-time and batch processing operating systems, diagnostic programs, and FORTRAN language. Moreover, research and development efforts were being made in the following areas: time-sharing system, COBOL, PASCAL, databases and network. The realization of serialization has enabled our country to devote more time and effort on the development of various kinds of operating systems, large variety of high level algorithmic languages and all kinds of service and maintenance programs. For instance, the DJS200 series has over 1 million bytes of software.

The newest, and also the most extensively used machines which have developed faster than any other kinds of computers are microprocessors. China began research and development in this area in 1974, and produced prototype models in 1975. In 1977, final decisions were made to develop eight models in the DJS050 series and DJS060 series. Technologically, the PMOS had already gradually moved to NMOS and I^2L. Moreover, the degree of integration continued to grow, thus bringing about the transition from multi-chip to single-chip CPU. As a result, prices have been coming down continuously. The most active elements in microprocessor research and development are found in institutions of higher education and some relatively small factories and [research] institutes. As microprocessor chips are very cheap in the international market, the use of imported chips for developing systems for users is gradually increasing, which will undoubtedly promote the growth and extensive use of microprocessors in the country. Microprocessors are widely used in such areas as energy, machinery, metallurgy, communications, education and national defense. Moreover, they have competitive prices. The development of microprocessors has received the highest attention and full support of the Computer Committee of the State Scientific and Technological Commission, and the State Computer Industry Association.

Table 1 shows the hardware technical characteristics of typical models which have been developed. Table 2 shows the software configuration of some series.

Some 40 computing technology research institutes and several hundred computer centers (stations) have been set all over the country by the electronics industrial sector, the Academy of Sciences, as well as other sectors and locally-administered organizations. Some 60 institutions of higher education have established computer science and engineering departments and disciplines, and

Table 1. Hardware Characteristics of Some Computer Models

Characteristics		TQ-16	DJS-183	655	151	150	DJS-260	013	HDS-9
Year produced		1971	1976	1972	1979	1973	1979	1976	1979
Main speed		11	20	90	110	120	100	150	
Main frequency MC		3	2.8-3.1	3	4	3.1	4	5	5-6
Word length (bit)		43	16	48	32	48	32	48	42
Number of general use registers			8	4		16	16	16-84	
Number of instructions		51	70		160	94	187	93-112	
Main memory	Technique	Mag Core	Mag Core	Mag Core	Mag Core	Mag Core	Mag Core	Mag Core	Mag Core
	Capacity	32	28	32KWx4	32KWx8	32KWx4	32KWx(2-8) Double Word	32KWx4	32KWx(6-18)
	Cycle (microsecond)	2	2.4	2	1-1.6	2	1.2	1.5	1.2
	Number of crossovers			2/4	4	4	4	4	2.8
High speed buffer	Technique								
	Capacity	-	-	-	256-512	-	-		2x512
	Cycle ns				200-250				333
Advanced control				yes	yes	yes	yes	yes	yes
Flow					yes		yes		yes
Multifunctional unit					yes			yes	yes
Virtual memory								yes	yes

Table 2. General Survey of Computer Series Softwares

Software	Computer Model										
	DJS-100				DJS-180			DJS-200			
	110	130	131	140	182	183	184	10	20	40	60
Assembly	v	v	v	v				v	v	v	v
Macro assembly		v	v	v	v	v	v				
Expanded assembly		v	v								
ALGOL-60		v	v	v				v	v	v	v
Expanded ALGOL-60											
BASIC single user	v	v	v	v	v	v	v	v	v	v	v
BASIC multi user		v	v	v	v	v	v	v	v	v	v
FORTRAN-IV		v	v	v	v	v	v	v	v	v	v
Expanded FORTRAN-IV								v	v	v	v
FORTRAN-V				v							
COBOL							v	v	v	v	v
Supervisor											
Operating systems — Real time	v	3*	3*	4*	v	v	v	DJS			
Operating systems — Batch Processing								DJS-XT1	DJS-XT1	DJS-XT2	DJS-XT3
Operating systems — Time sharing											
Diagnostic programs	v	v	v	v	v	v	v	v	v	v	v
Notes					Also known as CK-800, SJ-55 series						

Footnote: In different system configurations, "3" represents SOS, RTOS or RDOS operating systems; "4" represents SOS, RTOS, RDOS or MRDOS.

have turned out quite a few technical people with specialized training for research, designing, manufacturing and application fields. As computer service centers appeared at a fairly late period of time in this country, there are over 1,500 organizations throughout the country that have their own in-house hardware maintenance and application software development personnel. There are approximately 70,000-80,000 people throughout the whole country who specialize in computer research, designing, manufacturing, application and education.

Each year, the China Computer Society organizes ten-odd academic exchange activities. In late 1979, nearly 400 papers were presented to the Fifth Annual Computer Convention held in Kunming. The papers reflected the achievements and level of research attained by China over the past year in such new architectures as large-frame vector computers, computers using crossbar (switching) units, online systems, distributed computer systems, multicomputer systems, network, array computers, fault tolerant systems, and recombination

systems. The papers also dealt with such areas as artificial intelligence, theorem proving, n-valued logic, pattern recognition, as well as such computer applications as transaction processing and industrial process control.

Although our country has managed to form a large research and development contingent for mainframe designing, peripherals and components, the forces are fairly scattered and lack sound organization and coordination. As we are still fairly weak in such areas as precision machinery processing, basic materials and technologies/techniques, the development of peripherals and components has always lagged behind the development of mainframes. In recent years, we have further intensified our investments and research forces in these weak areas.

Looking at the growth of China's computer industry, according to incomplete statistics, from 1956 to 1970, the accumulative total of installed machines grew at the average rate of 28.6 percent. If the accumulative total continues to grow at this rate in the future, by 1985 our country will have produced 11,778 machines; by 1990, the accumulative total will be 41,428, which is less than the total number of machines installed in the United States in 1976. By that time, there will be 35 machines (currently 3 machines) available for every one million persons, which is near the 1976 level of Spain (which ranks 12th place in the world). It can be seen that in the forthcoming decade, owing to the comparatively small radix and the great demand for computers, it will be possible to maintain the current growth rate, which will be quite adequate for the needs of the developing situation.

China imports computers from 14 countries; by early 1979, the total figure reached 294 machines. Of all the imported computers, 37.7 percent had been imported from the United States, 30.3 percent from Japan, 9.9 percent from France, 8.8 percent from West Germany, and 3.1 percent from England. NOVA machines accounted for the largest proportion (10.9 percent) of imported equipment; PDP-8 and PDP-11 ranked second place (6.8 percent). Although imported computers only account for 11.5 percent of the China market, they have brought tremendous impact on domestically produced machines.

Peripherals are a weak link in our country's computer hardware industry. At present, the industrial sector can only provide users with 10 different varieties of equipment, totaling 41 different models. Some users have to approach research organizations in order to purchase peripherals which can meet their high-standard requirements. The problems underlining our peripheral products are: lack of quality and variety, and the great disparity among magnetic disks, which have affected the popularization of computers. Our country has now developed a certain capacity for producing peripherals.

What is especially worth mentioning here is the fact that the popularization of computers is still the weakest link in China. One encouraging development in recent years is the emergence of computer application service centers. But this is still a far cry from satisfying the daily growing market demands.

The author believes that the current slump in computer industry brought about by the adjustments being made in our national economy is only temporary. As

As improvements are made in our nation's economic management, more factories, mines and enterprises will need scientific production planning and financial management. From the current realm of applications which draw heavily on technical, financial, and know-how resources, our computer industry will move on to broader use primarily in the areas of transaction data processing. In view of the extensive use of computers and shortage of software, the computer industry will increase its work forces to meet the situation.

Table

Country	Company	Model	Number of machines installed (A)	Market share percent (A/B)	Market share percent (C/B)
United States	DEC	PDP-8, 11	20	6.8	
	Varian	620/L-100	14	4.75	
	Wang	2200	14	4.75	
	DGC	NOVA	9	3.1	
	HP	9800,2100	8	2.7	
	Others		46	15.6	
	Accumulative total C		111		37.7
Japan	Minicomputers	NOVA	23	7.8	
	Shimazu	CT, DCP	10	3.4	
	Hitachi	HIDIC, M	9	3.1	
	Hokushin	HOC	6	2.0	
	Others		41	14.0	
	Accumulative total C		89		30.3
France	Telemecanique	SOLAR	6	2.05	
	Intertechnique	MULTI	6	2.05	
	Others		17	5.8	
	Accumulative total C		29		9.9
West Germany	Siemens	7700, 330	11	3.7	
		cp550	15	5.1	
	Accumulative total C		26		8.8
United Kingdom	C		9	3.1	3.1
Eastern Europe/USSR C (5 countries)			18	6.1	6.1
West/Northern Europe C (4 countries)			12	4.1	4.1
Grand Total B			294	100.0	100.0

IDEAS ON DEVELOPING CHINA'S MICROCOMPUTER TECHNOLOGY GIVEN

[Article by Professor Li Sanli [2621 0005 4539], Qinhua University: "Some Ideas on Developing Microcomputer Technology in Our Country"]

[Text] Paying attention to developing trends in foreign countries and drawing on the experiences of others can be helpful in bringing about modernization of our country's science and technology. In this article, the author looks into the practical experiences of foreign countries and combines them with some of his ideas on developing China's microcomputer technology.

(1) How to develop 16-bit microcomputer technology: It was in 1978 when 16-bit fourth generation microprocessors made their debut in foreign countries. Over the past 2 years, the Americans have summed up quite a few positive and negative experiences. in the past, Intel always strove to be the first to come up with new 8-bit and 16-bit machines, but neither product line had been thought out systematically or comprehensively. National Semiconductor developed 32-bit, 16-bit and 8-bit machines as an integrated series, and began producing NS16032, NS16016 and NS16008 series. Subsequently, Intel finally came to recognize the importance of developing microcomputers along the same lines as minicomputers and large frame machines, and they should all be designed as one entire series. Last year, Intel announced it would produce 32-bit, 16-bit and 8-bit iAPX series machines: iAPX432, iAPX286/288 and iAPX186/188. Intel also planned to combine the original 8086 and 8088 with 8087 and 8089 into iAPX86/88. The object code of 8-bit iAPX186/188 would be compatible with 8086 (8088) in order to replace 8085, prevail over Z80, and eventually dominate the 8-bit microcomputer market. Evolved from 8086 technology, 16-bit iAPX286/ 288 machines are five times faster than iAPX86 and also configured with memory management and protection capabilities to overcome the fundamental drawbacks of 8086. They also have 16 megabyte real address capability. iAPX432 is a 32-bit product composed of 43201 instruction decoder (100,000 transistors), 43202 microinstruction executor (60,000 transistors) and 43203 interface processor (65,000 transistors); the operating system is hardware (installed in solid-state circuit) and the ADA language is used. Zilog also announced it would develop Z8003 and Z8004 which were to be improved products based on Z8001 and Z8002. Thus, it can be seen that 16-bit microprocessors went through fairly great turbulences. Up to now, there is no steady marketplace for general-purpose microcomputer systems composed of 16-bit fourth generation microcomputers. Those manufacturers who announced last year that they would produce

16-bit general purpose microcomputer systems have now found themselves in an awkward predicament. Thus, there is no need at all for China to follow the "fashion" by introducing or imitating 16-bit general-purpose microcomputer systems. As this kind of technology is immature at the moment, it is best to wait and see for a while. But this does not mean at all that we cannot use 16-bit single board models (e.g., SDK86 or iSBC86) for special data processing or data control—this type of technology is quite mature and extensively used in other countries, and some organizations in our country actually have practical needs for it. Nor does it mean that we should not enhance our efforts in the study, analysis and digestion of information on 16-bit microprocessor technology, such as Intel 8086, Z8000 and MC6800. Past experience should be remembered. In 1974-1975, a group of researchers in our country began intensive research on Intel 8080; it was precisely due to their efforts that we acquired the ability in 1980 to produce 050 and 060 series machines. 16-bit microcomputer technology is even more complex. If we intend to develop the capacity to produce 16-bit series machines by the mid-1980's, we must now begin to organize intensive research on 16-bit microcomputer technology.

(2) Direction in which importing and developing 8-bit computer system technology should be carried out: At present, we are still focusing on 8-bit machines which also constitute the chief line of products being imported into this country at the price of enormous sums of foreign currencies. In foreign countries, two remarkable trends in the development of 8-bit microcomputer systems have taken shape: First, the higher end of 8-bit microcomputer systems (price range: $8,0000-10,000) are seriously challenged by microminicomputers (such as LSI-11 cpu systems). The prices of microminicomputers are still coming down and there is a great variety of software for such machines. Thus, microminicomputers have the upper hand in the competition. As the higher end of microcomputer systems are not doing well in foreign markets, many manufacturers have turned to low-price microcomputer systems in the approximate range of $4,000. For an additional amount of $4,000, such systems can be upgraded with 8 inch Winchester hard disks with capacities ranging from 10 megabytes to 18 megabytes. Besides, since the second half of 1980, large quantities of 8-bit multiprocessor systems have emerged. Generally, a work station consists of a stand-alone terminal microcomputer configured in an operating system and four kinds of high-level languages; but multiple work stations can share one or more hard disks. The mode of resource sharing can either be simple chain structure or bus arbitration structure.

While thousands of 8-bit microcomputers have been imported into our country, the selection is often based on the recommendation of one or two Hong Kong or foreign dealers. Some of the treasured models are actually obsolete in foreign countries due to excessive radiation harmful to health. Some of the foreign merchants who are treated as honored guests are actually dumping unsalable products into China at exorbitant prices. All this is related to the fact that we are not well informed on market conditions. The author believes that we should first of all greatly strengthen and support the development of Chinese-made 8-bit microcomputers, and develop the software needed for system configuration as soon as possible. Even the 050 or 060 series can satisfy the basic needs of our country for 3 or 5 years if we can commercially produce such

microcomputer systems configured with 64 K memories, floppy disks, printers, and CRT display units, and furnish them with CP/M or ISIS operating systems and three or four high-level languages. Secondly, it is necessary to import an appropriate quantity of foreign-made models, but the models should be representative of the latest technology and not obsolete or unsalable goods. Before any model is imported, it is important to solicit suggestions from all departments, especially technicians of other departments, so as to minimize biased decisions. To a certain degree, the importation of small quantities of low-price models with hard disks or multicomputer capacity for the purpose of analysis and digestion can be of value to the improvement of 8-bit microcomputer technology in our country.

Another problem is how to make maximum use of the several thousands of microcomputer systems which have already been imported or developed. It is reported that many users use such machines merely for BASIC language programs, which is really a pity. For BASIC, machines in the $400-500 price range would be quite sufficient--why spend thousands of dollars? Moreover, if all of the several thousands of microcomputers were used only for scientific computation work, the market would become saturated in no time. It is necessary to vigorously popularize 8-bit microcomputer applications, especially those related to industrial, business and agricultural management.

(3) Vigorously develop the applications of single-board machines: In foreign countries, OEM is still the largest market for microprocessors, especially single-board machines. Our country is way behind in this area. The popularization of single-board machine applications can have an immediate effect on the improvement of the productive and technical level of China's industry and agriculture, and should thus be given due attention by all organizations. The author also advocates the need for China to design its own single-board machines in accordance with practical needs in the country. At present, there are not enough single-board machines to meet the demands in foreign countries, and their prices are going up while chips are still becoming increasingly cheaper. Our country should take advantage of this opportunity to import chips and start designing and assembling its own single-board machines. The prices of foreign-made single-board machines designed for basic instructional and simple control uses range approximately from $350 to $400; the cost for designing our own machines with imported chips would cost approximately $150-200, and it is also possible to produce machines with better performance than foreign-made products. This is one of the few computer products competitive in foreign markets that our country is able to produce. China's technical force is fully capable of designing high quality single-board machines.

(4) Attach importance to the role of microcomputers in education and training: Over the past 20 odd years, the computer enterprise in our country has been in a state of "three divorces," i.e., hardware divorced from software, processor divorced from system, mainframe divorced from application, which has gravely affected the progress of our computer enterprise. The "three divorces" state is related to the drawbacks which have existed in our computer science education for many years. In other countries, computers are taught as a complete system in many university-level computer science courses. For example,

MIT's "Computer Structure" course begins from computing methods to software designing, and finally hardware implementation; all this is taught as one complete course. Other courses, such as program designing, operating systems, etc. also follow similar lines. By the time they complete the courses, the students will have mastered the use of computers. In China, due to limited funding, many schools cannot afford to purchase large or medium frame machines; they should thus focus on microcomputer systems. Microcomputer systems are cheaper, and although they may be small, they are quite complete in terms of capabilities and functions. Moreover, they are excellent for interactive work with students. With microcomputers, it is entirely possible to combine software with hardware, processor with system, and mainframe with application in the classroom. In the past, lessons on microcomputers used to be regarded as the continuation of courses on medium and large scale integrated circuits, i.e., they were taught as "hardware" courses; this kind of concept is wrong. The training of people is an undertaking of vital and lasting importance. It is hoped that all schools will enhance the role of microcomputers in computer science education, and continuously sum up experiences. All concerned organizations should not overemphasize large-frame computer centers; instead, they should provide adequate funding and support to universities and colleges which want to set up microcomputer systems.

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FIRST MICROCOMPUTER WITH LARGE-SCALE INTEGRATED CIRCUITS

[Article: "DJS-062 Microcomputer Successfully Produced"]

[Text] Jointly developed by the Liaohe Experimental Research Institute and
other organizations, the DJ2-062 microcomputer made its debut in June 1980
at the National Computer Exhibition sponsored by the State Computer Bureau and
won excellent commendations as the first-ever microcomputer with large-scale
integrated circuits totally manufactured in China. On the eve of National Day
1980, as the result of further research and development, the Institute pro-
duced the DJS-062A single-board microcomputer with large-scale integrated cir-
cuits completely designed and manufactured by its own personnel. The size of
the model is 312 x 220 x 25.5 mm. It weighs 900 grams and its technical char-
acteristics have reached the same level as Motorola's 8-bit microprocessor
(MEK6800/D2).

The word length measures 8 bits and the machine can handle double-length or
multiple-length computation with 16-bit addresses. An 8-bit duplex data bus
is employed, and the main frequency is 612.5 KHz.

The microcomputer is equipped with 72 commands, 197 machine codes, 7 addressing
modes. The execution of a command takes from 3.25 to 19.5 microseconds to
complete. The execution time of 80 percent of the commands falls within 8.15
microseconds.

The single-board model has a 1 kilobyte random-access memory (1 kilobyte
static RAM), 1 kilobyte monitor program memory (8 K ROM), 1 kilobyte user-
erasable memory (8 K EPROM). Depending on the user's requirements, 8 to 24
kilobytes of memory can be added to the machine.

The computer has a fairly good interface capacity for accommodating external
equipment; it is equipped with parallel peripheral interface adapter (PIA) and
serial asynchronous communication interface adapter (ACIA). Various types of
peripherals can be tied into the system through the same interface; this is
achieved by merely altering the program to change the function of the inter-
face.

The microcomputer has an online keyboard with 16 numerical keys, 8 command
keys, 6 Nixie tubes (4 for displaying addresses, 2 for displaying data), an

audio-frequency cassette tape drive, and a small printer (DP-822 model, 21 column narrow-width printer). In addition, the user has the option of installing a 32-64 column visual display unit (CZX-1 type CRT) for displaying simple characters, as well as optical reader, punch-card machine, 80 column (wide column) printer, and X-Y function graph plotter.

The software system now supports the following: (1) JBUG supervisor (fixed in ROM); (2) peripheral supervision programs; (3) MPU, PIA, RAM self-checking programs; (4) analog programs (using DJS-130 analog DJS-060 series); (5) character-display control programs, etc. Besides, it also has BASIC, self-compiling compiler, etc. which is quite useful. The large-scale integrated circuits and TTL interface circuitry in the DJS-062 model are all produced by the institute and includes the following: (1) microprocessor; (2) 1 K static RAM; (3) peripheral interface adapter; (4) 8 K ROM; (5) (serial) asynchronous communication interface adapter; (6) 8 K erasable ROM; (7) 8-bit digital-analog converter; (8) 8-bit analog-digital converter; (9) 8-line 3-state driver; (10) 8-line power gate drive; and (11) 8-line OC gate drive.

The preceding parts were all developed and produced with China-made installations, such as the PB-1800 automatic photolithographic machine; the DJS-130 computer put out by Beijing Radio Plant No 3; the TF-1 pattern generator; J59-60 60 KEV ion implanter; laser positioning type II and Type III step-and-repeat system produced by Qinghua University in Beijing; and the grating positioning JS-3 type 4-head microreducer produced by another institute. Some installations were put to use only recently. The trial production of large scale integrated circuits proves that China-made installations can perform fairly well and meet the designed performance requirements as well.

Following their successful development, the DJS-061 multi-chip and DJS-062 single-chip models have already begun to be used in a number of applications. Besides the preceding microprocessor program-controlled character display and microprocessor program-controlled wire printer, the institute has also ventured into such areas as the application of microprocessor-controlled diffusion furnace, and conducting large-scale integrated circuit tests controlled by DJS-060 series microcomputers; the results have been gradually introduced to all the research divisions in the institute. In some fraternal organizations, the DJS-060 microcomputer system is used for producing video frequency charts on radar display units and used in conjunction with the computer mainframe of an engineering tracking system; it is also used for controlling log separators in the forestry industry, as well as for controlling machine tools.

The institute is now actively engaged in further research efforts to develop all kinds of software for this type of microcomputer, expand its system capability, and switch from trial production to batch production as soon as possible.

9119
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FIVE-YEAR MICROCOMPUTER SOFTWARE FORECAST

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 13, 5 Jul 81 p 2

[Article: "Five-Year Forecast for Microcomputer Software"]

[Text] 1981

●IBM introduces 380 Personal Computer System with computing capabilities compatible with IBM370 mainframe, priced below $3,000.

1982

●Japanese manufacturers launch massive invasion of home computer market with very powerful personal computers compatible with Micro Soft's currently available BASIC and CP/M software library. Price under $300.

●Knight-Ridder and American Telephone and Telegraph announce joint nationwide visual data service.

●United Services of America (?), Computserve and Radio Shack start marketing the 50th electronic system for household banking application.

●Powerful but inexpensive comprehensive video frequency terminals on the market.

●Program generators will make up for the shortage of programmers, but not for talented system analysts.

1983

●All major printed circuit manufacturers will either set up software departments or buy stocks from software firms.

●All major toy and recreational equipment companies will set up software departments.

●Software firms with $100 million annual sales volume will emerge.

1985

●Birth of the 1,000th computer software manufacturer.

●Manufacturers agree on various standards for software and high-level languages.

●English-language programming becomes the overwhelming majority portion of the software market.

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DJS-130B MICROCOMPUTER TO BE PRODUCED, MARKETED 'SOON'

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 18, 20 Sep 81 p 1

[Article: "DJS-130B Computer Will Be Available Soon"]

[Text] The DJS-130B Electronic Digital Computer Evaluation Meeting was held in Shanghai on July 30-31. Present at the meeting were 200-odd representatives who carefully reviewed and evaluated the computer which had been jointly developed and manufactured by the Huadong [East China] Computing Institute and Shanghai Zhongxing Radio Plant.

The participants agreed that besides hardware/software interface compatibility with the original DJS-130 machine, the B model had remarkably improved performance and structure. B model's main memory consists of 8 K x 16 bit basic cells composed of imported 4 K dynamic MOS storage components, and can be expanded to 32 K. Dual-in-line packaged [DIP] medium and small scaled integrated circuits are used, and necessary simplifications and adjustments are made in the logic, thus not only increasing operation speed from the original DJS-130 level of 500,000 operations per second to over 800,000 operations per second, but also reducing the size to one-fourth of the original model, and cutting the cost by one-half.

During the evaluation stage, the participants revised an on-site operation demonstration of the DJS-130B model; they thought very highly of the machine's reliability and resistance to interruption, and gave a lot of valuable ideas and suggestions with regard to improving the machine's performance. The representatives were unanimous in expressing hope that the design of this model would be finalized soon for production and marketing.

9119
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MIC-85 SINGLE-BOARD MICROCOMPUTER NOW IN BATCH PRODUCTION

[Article: "MIC-85 Single Board Microcomputer Now in Batch Production"]

[Text] The MIC-85 single board microcomputer was developed by the Microcomputer Research Section of Shanghai Jiaotong University. All the components are installed on a single 350 x 270 square mm double-side printed wiring board, thus constituting an integral microcomputer which can be extensively used in education, training, data processing, process control. digital communication, signal control and LSI circuit testing. It is fully compatible with the SDK-85, a foreign made model; but its capabilities are considerably expanded.

The MIC-85 uses an 8088A for its CPU; the clock frequency is 3.072 MHz; the basic instruction execution time is 1.3 microseconds. An 8 kilobyte low power dissipation static RAM and an 8 kilobyte EPROM are installed on the board. The single board model runs on a 5-volt power supply. Configured with the board are a 6-digit hexadecimal display unit and a hexadecimal keyboard. It is equipped with such interface circuits as audio cassette recorder interface, standard CRT interface, wire printer interface and EPROM programmer.

The MIC-85 has relatively good performance/cost ratio; its parts are manufactured both in China and foreign countries, i.e., foreign parts are used wherever Chinese made ones are not up to international standard.

The MIC-85 microcomputer is currently produced in large volume by Shanghai Jiaotong University. To ensure that users can purchase MIC-85 single board machines at prices no higher than comparable domestic products, the floating price system is used. The Hong Kong Jing Ye Computer Company is prepared to handle marketing abroad.

9119
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MIC-85 MICROCOMPUTER NUMERICAL CONTROL SYSTEM

[Article: "New Microcomputer Numerical Control System for Wire Cutting Machine Tools"]

[Text] With the full support of Shanghai Machine Tool Plant No 8, the Shanghai Machine Tool Research Institute and the Shanghai Jiaotong University jointly developed a new microcomputer numerical control system (MCNCS) for wire cutting machine tools in half a year's time. On 27 December 1980, the system passed the Scientific Research Achievements Evaluation Test.

The research started as one of Shanghai City's major scientific research projects. The successful development of the system constitutes an encouraging step for the application of microcomputers in machine tool control. The microcomputer system has been used for controlling taper cutting and withdrawing broken-wire to the processing points(?), thus filling in the gap in China's numerical controlled machine tools. Based on the results of preliminary test runs on scores of parts and tests conducted by an evaluation group, the system has demonstrated such capabilities as controlling linear/arc slotting (?), taper cutting below 1°, withdrawing broken-wire processing point (?), skip processing (?), etc. The system is configured with automatic programming software, and can correctly compose programs for controlling the processing of complex parts and tapered parts. The system employs the technically-advanced MIC-85 microcomputer which has an 8085A central processing unit and is compatible with DJS-051 and DJS-052. The system can use a cassette recorder which can input large volumes of processing programs in one read session; there is no need for punching or verifying paper tapes, thus eliminating the need for tedious work and greatly reducing the use of manpower. The debugging of system software and automatic programming software can be performed with DJS-053 or Z-80 machines; thus, the system has room for expansion. Compared with the original numerical control box system, microcomputer numerical control systems have such advantages as stability and reliability, good adaptability, easy to operate and maintain. Owing to its low power consumption, compact size, light weight and great flexibility, it can be easily integrated into a machine tool.

Based on evaluation tests, the system is quite successful and its performance is up to the domestic advanced level. During the trial use stage, the machine tool was used to cut a 30° tapered part with complex geometric design for the

Shanghai Wired Communications Plant. Through automatic programming, the system processed the product according to the geometric and tapered specifications. Both the factory and evaluation test group were satisfied with the result, and they believed that the system had great practical and economic values. The participants at the evaluation meeting hoped that the blueprints for the integration of the machine tool and computer system would be produced as early as possible to meet the needs of users.

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DJS-054 MICROCOMPUTER COMMERCIALLY PRODUCED

[Article: "DJS-054 Microcomputer Finalized and Put Into Mass Production"]

[Text] A meeting was held in Shanghai on 28 July to finalize the design of the DJS-054 microcomputer produced on trial basis by the Shanghai Computer Plant. Based on system capability tests, mainframe and system stability tests and routine tests, as well as long period of trial use by various users, the representatives at the meeting unanimously agreed that the DJS-054 microcomputer had reached the domestic advanced level as far as its system stability and reliability, environmental adaptability and hardware/software performance were concerned.

The CPU of the DJS-054 machine is an 8-bit 8080A processor and its characteristics are as follows: word length 8 bits; 78 basic instructions; instruction cycle 2-9 microseconds. An S-100 bus is employed, and all the bus signals are compatible with TTL level. Memory: ROM and RAM; transistorized memory; 8 K modular expansion, maximum direct addressing 64 kilobytes.

Input/Output: asynchronous waiting, 1-line 8-level priority vectored interrupt and direct memory access capabilities; I/O instruction direct addressing 256 input ports and 256 output ports. The system can support floppy disk storage, CRT character display unit, cassette tape drive, photoelectric unit, paper tape punch unit, console monitor typewriter with keyboard, high speed line printer, analog I/O, switching I/O, etc.

System software: CP/M 1.4 operating system, under which are: utility programs, such high level languages as CBASIC, PASCAL and PL/M; as well as monitor, editor, debugging routines, arithmetic library, etc. At present, imported LSI circuits are used in DJS-054 machines. But Shanghai's trial-produced 8080 family components are completely suitable for substituting any of the parts in the machine. All peripherals are made in China, which makes it convenient not only for maintenance, but also for popularization.

The DJS-054 model is used fairly extensively; it can play a useful role in such areas as: data gathering, industrial control, scientific experiment, enterprise management, commerce, communication, biology, medicine and education. It can also serve as microcomputer developing system where it has an enormous capacity for development work. It can also be used as multiple-level control in larger application systems.

9119

W6800 8-BIT SINGLE-CHIP DJS-062 MICROCOMPUTER DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 10, 20 May 81 p 1

[Article: "Sichuan Solid State Circuit Research Institute Successfully Develops DJS-062 Microcomputer With Single Chip Microprocessor"]

[Text] Recently, the Sichuan Solid State Circuit Research Institute successfully developed the DJS-062 microcomputer which is completely composed of Chinese-made components, including its own LSI circuit products, such as the W6800 8-bit single chip microprocessor, W6820 1024-bit static RAM, W6830 8192-bit read-only memory (ROM), and I/O interfaces. The design of the microcomputer was formerly evaluated and finalized at a ministerial level design-finalization meeting which was held from the 15th to 19th of April this year.

The microcomputer represents the first finalized 062 machine developed on the basis of the W6800 single chip 8-bit microprocessor produced in China. Its performance has reached the same level as MEK6800, a foreign-make comparable model. Following are its main characteristics:

Main frequency	:	614.4 KHz
Wordlength	:	8 bits (parallel operation)
Basic instructions	:	72 instructions, 197 machine language codes
Address mode	:	7 modes, addressable memory 65 K
Memory capacity	:	Expandable to 2.5-4.5 K, maximum 64 K bytes
Interrupt ability	:	3 levels of hardware interrupt and 1 level of software interrupt

Through reliability and durability tests, as well as trial use over a long period of time by the Chongqing Instruments and Automation Institute, the performance of this particular model has proven to be both stable and reliable.

The Sichuan Solid State Circuit Research Institute is now manufacturing this type of microcomputer on small-scale production basis.

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DJS-130 COMPUTER TEACHING SYSTEM DEVELOPED BY ZHENGZHOU ENGINEERING COLLEGE

[Article: "Zhengzhou Engineering College Develops DJS-130 Computing Education System"]

[Text] For some time, instructors and students of higher educational institutions had no access to computers, thus affecting the problem of improving the quality of education. To remedy this situation, the Zhengzhou Engineering College has developed a basic but effective multi-terminal computer teaching system under the supervision of the Henan Provincial Science Committee, Bureau of Education, and Electronics Bureau, and with the cooperation of Kaifeng Computing Institute, Shaoyang Radio Plant and Weifang Computer Plant. The system consists of the Chinese-made DJS-130 minicomputer which supports magnetic tape drive, multiplex communication control unit, and 12 (or 16) online terminals; its software consists of real-time disk operating system (RDOS) under which multi-user BASIC and FORTRAN system programs and application softwares are supported.

Since June 1980 when it was first put to operational use, almost 800 users on and off the campus have logged onto the system; students in groups of 20 have learned programming languages through online terminals with 4-5 online hours per semester for each person.

Although the system is fairly simple, it requires little investment and the results are excellent. Under current conditions, it can meet the demands for solving small computational problems in education and scientific research work. The system has, moreover, withstood stringent evaluation tests. This is the first multiple terminal system ever used in China's higher educational schools. It is a remarkable achievement which will enable schools of higher education in general to set up inexpensive but functional computing education systems of their own. In order to satisfy the demands of educational organizations and the broad ranks of users for multiple terminal computer systems, the computer service company of the main bureau will provide contract support service to users of the system, including installation, debugging, maintenance and training; schools of higher education can have special price discounts and credit loan service.

TD REMOTE TIME DIVISION SYSTEM DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 16, 20 Aug 81 p 1

[Article: "TD Remote Time Division Online System Successfully Developed by Ministry of Post and Communications"]

[Text] The Data Transmission Research Institute of the Ministry of Post and Communications and the Computer Science Department of Nanjing University have jointly developed a remote time division online system completely composed of Chinese-made equipment; the system passed the technical evaluation tests organized by the Research Academy of Post and Telecommunications Science on 2-6 June. Some 40 representatives of 30-odd organizations participated in the evaluation meeting, including the Chinese Academy of Sciences, various ministries and commissions, as well as universities and colleges.

With the TQ-16 as the mainframe, the system is confirmed with a complete set of Chinese-made hardware equipment, such as the DJ01 front-end minicomputer, dual interface, multiple controller, modem, and Model 55 teletypes developed by the Data Transmission Research Institute under the Ministry of Post and Communications. It is also configured with time division operating system, interactive language, and software for handling post and telecommunications business which were jointly developed by the Data Transmission Research Institute of the Ministry of Post and Communications and Nanjing University. The time division system can accommodate four terminals simultaneously logged onto the host computer through communication networks.

Since August 1980, four terminals located in Hangzhou, Shijiazhuang, Hefei and Beijing have been used for numerous and lengthy trial runs, such as scientific computations and postal/telecommunication business job runs. The results showed excellent system performance and stability.

Three 50 baud online terminals were used during the technical evaluation period and were distributed along the Beijing/Shijiazhuang and Beijing-Hefei-Beijing loop lines. The three terminals worked simultaneously, and the entire system worked for 36 consecutive hours before manual termination of the run. The test operation went very smoothly and all predetermined test items were successfully completed.

The participating representatives agreed that the remote time division capability of the preceding TD online system had been successfully achieved by employing the CPU-peripheral serial configuration with the Chinese-made TQ-16 machine as the mainframe supporting a front-end minicomputer, dual interface, dual-processor operating system and digital transmission system. It was a successful attempt and breakthrough which reached the domestic advanced level. The representatives pointed out that if the large number of domestically-produced TQ-16 machines could be improved along the same line, it would be possible to greatly increase the utilization ratio at low cost. They suggested the popularization of this particular achievement, which would help expand the application range of computers and develop computer-data communication systems.

9119
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CJ-709 FORTRAN COMPILER SYSTEM DEVELOPED

[Article: "FORTRAN Compiler System Available in CJ-709 Computer"]

[Text] Internationally, FORTRAN is one of the most popular high-level pro-
gramming languages. With the ever-increasing number of contacts with the
international community, the volume of technical information on FORTRAN pro-
gramming and application software is also increasing day by day. Designed in
China, the CJ-709 medium-frame computer (currently one of the chief types of
computers used for scientific computations in the Shanghai Area) used to sup-
port ALGOL only. To make maximum use of available computer resources, the
Shanghai Machinery Institute, Shanghai Medical Designing Institute and the
Shanghai Power Equipment Research Institute jointly developed the CJ-709
FORTRAN compiler system which has been tested and approved for practical use.

Based on the ISO version of the FORTRAN text which is widely used in the
international community, the CJ-709 FORTRAN text was developed according to
the specific characteristics of the CJ-709 machine, putting in an appropriate
amount of restriction and expansion.

The chief characteristics of the text compiler system are:

(1) Composed of five modules: Overall control module, sequence module, syn-
tax analysis module, code generation module, and run subroutine module. The
overall control module is designed for controlling and scheduling, and it is
often installed in the internal storage. There are no direct links or sche-
duling among the other modules; they can only interact with the overall control
module which governs and schedules them.

(2) 3-pass scanning. The first pass uses the subroutine method for syntax
analysis, partial syntax checking, generating L1 intermediate language and
corresponding tables. The second pass uses the transition matrices method
for syntax analysis, generating quarternary forms as well as for expression
optimization and partial loop optimization. The third pass converts the source
program into its equivalent object program in machine language instruction form.

(3) The entire compiler system was developed with the ASSEMBLY language which
is easier to read, easier to revise and debug than manual programming.

9119
CSO: 4008/98   - 24 -

SOFTWARE PACKAGE FOR CTS-2 PLOTTER PASSES EVALUATION TEST

[Article: "Software Package for CTS-2 Automatic Plotter Passes Evaluation Test"]

[Text] The Computer Aid designing Center and Engineering Drafting Teaching and Research Group of Qinghua University have jointly developed a general-purpose plotting software package for the CTS-2 automatic plotter. Last November, the package won excellent commendations at a CTS-2 evaluation meeting.

With the DJS-130 computer and its disk operating system RDOS as the basic resources, the plotting package was written partly in FORTRAN-IV and partly in the assembler language, using basic statements and instructions. It includes 31 basic subprograms and 72 character subprograms. The machine can draw straight lines, circular arcs as well as basic graphs composed of lines and arcs; it can also cause graphs to undergo translation, rotation or scale transformation. In the course of software development, emphasis was placed on simplifying program structure by fully adapting to and utilizing the hardware characteristics of the CTS-2 Plotter. As the package is composed of FORTRAN subprograms, the user can draw all kinds of graphs by calling up the subprograms. Users who already know the FORTRAN language do not require special training for using this package. It is an excellent means for plotting all kinds of charts used in civil engineering, machinery, large-scale integrated circuit, topographical survey, etc. With a minimum amount of modifications in the subprograms, the package can be used in other types of plotters and computers.

9119
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SEMICONDUCTOR RESEARCH INSTITUTE DEVELOPS 16 K ROS RAM

[Article: "China's LSI Research Results in Successful Development of 16 K MOS RAM"]

[Text] In October 1980, the Semiconductor Research Institute of the Chinese Academy of Sciences successfully developed the 16 K N-channel MOS dynamic random-access memory (RAM), which was a very encouraging step forward in China's LSI production.

The institute began the research project in early 1980. In less than 10 months time, the group of researchers overcame one obstacle after another under the personal guidance of the institute's deputy director, Wang Shouwu [3769 1343 2976], who is a famous semiconductor expert. In no time, they succeeded in designing the circuit and wafer pattern. The raw materials and technological equipment were basically supplied from domestic sources, thus creating favorable conditions for production in the future.

In the course of research, they strictly adhered to the laws of science, stressing the optimization of each and every link, and ensuring both the quality and stability of the technologies involved. On the basis of 4 K RAM single chip unit, they developed the dual-layer multiple silicon technology, thus further improving the level of integration, which enabled them to produce the multiple address time-sharing input type 16-lead 16 K dynamic RAM. It has a minimum line width of 5 micrometers: the chip size is 3.5 x 5.9 square millimeters; the total number of integrated components is approximately 37,000. The chip access time can reach 150 nanoseconds; the timing period is 375 nanoseconds. The power dissipation is 500 milliwatts. It operates on +12V, +5V and -5V sources. The input and output are TTL compatible. The configuration of the base-pin leads conforms to international standard.

Most of the researchers are young and talented people in China's semiconductor field. But they are not content with the current achievement. Instead, they regard it as merely a starting point. They believe that the whole purpose behind the research is to serve the society at large, and the fruits of their efforts should be transformed into the productive force and material wealth of

the society. To further enhance the quality and reliability of the product, improve the rate of finished products, and lower the cost, they are conducting even greater in-depth research and going further into the application of new techniques and new technologies, thus making even greater contributions to China's LSI research and development as well as production.

9119
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DJS-140 CAPABILITY ENHANCED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 9, 5 May 81 p 1

[Article: "DJS-140 Capabilities Enhanced"]

[Text] On behalf of the State Bureau of Computer Industry, the Beijing Electronics Instruments Bureau sponsored a DJS-140 Evaluation Meeting on 15-17 April, during which three machines trial-produced by Beijing Computer Plant No 3 were put through comprehensive testing and evaluation sessions. The participants of the meeting included 169 representatives from concerned leading organizations, scientific research organizations, institutions of higher education, industrial plants, and a total of 115 user organizations. Director Li Rui and Deputy Director Xia Mingwen of the State Bureau delivered important speeches at the meeting.

The evaluation meeting organized a machine assessment group consisting of 10 organizations, including Beijing Wire Communication Equipment Plant and Qinghua University, which conducted comprehensive system testing on the mainframe's stability, power deviation, resistance to interruption, interfaces and peripherals, ability to restart after power failure, as well as all the software supported by the machine. The representatives at the meeting carefully listened to and discussed all the assessment reports and examination reports, and watched demonstrations of machines under actual operation.

The participants agreed that on the basis of the finalized version of the prototype machine developed by a joint design group, the DJS-140 model produced by Beijing Computer Plant No 3 was characterized by improved structural technology, further enhanced capability, and fairly good job performance.

The evaluation results indicated excellent system stability and reliability; the continuous run time of the test machines accumulated to over 600 hours. The interfaces for magnetic disks, magnetic tapes and serial QTY were improved and perfected; the internal storage transformer drive [float] switch plan was successful. The mainframes have new rationally designed structures; the printed backplate wire wrapping technology was successfully applied. On the basis of the original software configuration, the following new features had been added: operating system [MRDOS] release 03 under which FORTRAN release 05, FORTRAN V release 05, ALGOL release 06, and multi-user editor release 06 were supported; the BASIC job stream was added to its batch job processing capability, thus

further enhancing 140 system's run efficiency. To verify the reliability of the machine, all the test problems were repeated on an imported machine, i.e. NOVA 3, and the results were completely the same.

DJS-140 is one of the high-range models among the 100 series computers.

Its components are all Chinese-made TTL medium scale integrated circuits. Its chief hardware indexes are: basic word length 16 bits, maximum internal memory 128 K; memory period 1.2 microseconds, fixed-point arithmetic averages 800,000 operations per second; float point arithmetic averages 30,000-50,000 operations per second; 22 basic instructions; 14 basic extended instructions; 34 float-point instructions; 11 internal memory management and component protection instructions. The 140 machine passed the evaluation test and was approved for batch production. It will enrich and perfect the 100 series.

The representatives hope that Beijing Computer Plant No 3 will foster its achievements, further enhance system support work, improve quality, reduce cost, provide good technical support service, and further satisfy the users' demands.

9119
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DJS-052II OPERATING SYSTEM EVALUATED

[Article: "DJS-052II Computer Operating System Compatible to CP/M"]

[Text] On 10-13 April, a DJS-052 evaluation conference was held in Nanjing and included the following sessions: "DJS-052I Microcomputer System Design Finalization Session," "DJS-052 Floppy Disk Operating System (FDOS) Technical Evaluation Session," "DJS-052II Hardware System Technical Evaluation Session." The conference approved the assessment and test reports presented by the joint survey group consisting of Qinghua University, Shanghai Computing Research Institute, and Automation Research Institute of the Academy of Sciences. The conference participants agreed that the performance of the DJS-052 computer was both stable and reliable, and the model was equipped with fairly complete software and hardware. The design of model I was finalized, and the conference endorsed the small-scale production of model II and popularization of the FDOS operating system.

Development of the DJS-052 microcomputer began in November 1978 in accordance with state plans. It was jointly designed by the Lanjing Aeronautical Institute [college] and Jiangsu Radio Plant, and it is produced by the latter. Both models I and II have the S-100 bus architecture, and the only differences between the two models lie in the peripheral control cards and peripheral configuration. Model I is currently used as a basic model equipped with photoelectric device, dot matrix printer and paper tape punch. By inserting a control card inside the case, it can be expanded into model II hardware system. Model II is basically equipped with the 052 mainframe, floppy disk drive, basic display unit, communication control keyboard, dot matrix printer. Based on their own needs, the users can add a number of optional external units and peripheral interfaces; audio (or digital) cassette drive, EPROM writer, X-Y plotters, A/D and D/A converters, digital I/O, IEEE 488 interface, CC-ITT interface, modulator/demodulator, etc. In software, the FDOS is a single-user operating system developed and transported by the Nanjing University, and there are currently three versions (052 FDOS versions 1.00, 1.02 and 1.04) which are compatible to Cromemco's CDOS, CP/M 1.3 and CP/M 1.4 respectively. Under the FDOS operating system, the 052 machine can run 10-odd utilities and language processing programs, such as conditional assembly language, compiler BASIC, FORTRAN, etc.

To provide the users with greater data reliability, the Jiangsu Radio Plant performs tests on 052 machines. The machines are subjected to 1,440 continuous hours of debugged trial runs. Subsequently, they are subjected to procedural tests, high temperature, low temperature, damp, vibration, impact, power voltage deviation, transportation tests, etc. Based on its performance in actual use by 10-odd users, the model has proven to be both stable and reliable.

The 052 system was developed consistently along the guideline of designing the hardware in accordance with the requirements of domestic production as well as the users' needs. At present, the components of the 052 computer are basically supplied by domestic sources; the 052I model is totally manufactured in this country. China now has the capacity to produce peripheral devices for the system, such as floppy disk drives, basic-type display units, dot matrix printers, which are characterized by high performance/cost ratio and have won excellent commendations from various concerned organizations.

9119
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NEW 100 SERIES MODEL DJS132 SYSTEM DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 10, 20 May 81 p 4

[Article: "New 100 Series Model: DJS132 System"]

[Text] The DJS132 is the improved version of DJS130, and a mid-range model of the 100 family for popularization use. Its design was finalized in Tianjin in March 1981 (see CHINA COMPUTERWORLD, 3 Mar 81 p 12), and is currently batch produced by the Tianjin Electronics Instruments Plant, Shandong Weifang Computer Factory, and Suzhou Computer Factory.

Special emphasis is placed on the overall integration of DJS132's system structure, capability index, structural technology and reliability. The machine is characterized by good reliability, excellent system support capacity, and high performance/cost ratio; it is a multipurpose minicomputer suitable for batch production.

Fourteen kinds of peripherals were used during the finalization testing stage of the DJS132 system, including the following: cartridge disk unit, floppy disk drive, one-half inch magnetic tape drive, communication and multiplexer, console monitor typewriters 1 and 2, line printers 1 and 2, plotter, image display unit, paper tape input unit, paper tape output unit, and real-time clock. It will continue to support cassette drives, magnetic drums, communication control units and Fast Fourier Transform (FFT) devices.

DJS132-support software includes: three kinds of operating systems, i.e., SOS, XRTOS, RDOS; all kinds of high-level programming languages, e.g., FORTRAN IV, real-time FORTRAN IV, extended ALGOL-60, single user and multiple user extended BASIC, and various assembler programs. All of the preceding system software is debugged and operational, and the DJS132 system has proven capable of satisfying all the software requirements of the 100 series systems. Besides, it is also equipped with a "multiple peripheral reliability test package" which can conduct random testing of the system with programs that run under a simulated operating system.

The DJS132 comes with 24 basic instructions (hardware-implemented) which the 130 system does not have. The mainframe's fixed point addition/subtraction speed is 670,000 operations per second; its multiplication/division speed is 130,000 operations per second. DJS132 uses few components for such functions

as multiplication and division, automatic program bootstrap, internal storage write protection, and hardware diagnosis.

The 132 model currently employs magnetic core memory, 8 kilobytes single board, 1.5 seconds access time cycle; and plans are made to install 32 kilobytes single-board memory units.

For external data bus, the 132 model employs a duplex power gate driven bus which can support a maximum of 61 peripheral interfaces; it has two information transmission modes between the mainframe and peripherals, i.e., interrupt and direct data channels. The external interface board hardware can accommodate the DJS153 machine.

To ensure good reliability, the 132 model uses carefully selected medium and small scale integrated circuits produced in dual-in-line packages by China, as well as such new components as printed backplates and 100 line pin-type sockets, 50 line flat cables, and pierce-type plugs. New ideas have been incorporated into the machine both in structural design and technology.

9119
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SHANGHAI'S FIRST DJS220 COMPUTER, EXTENDED FORTRAN TESTED

[Article: "Shanghai's First DJS220 Computer and Extended FORTRAN Pass Evalua-
tion Tests"]

[Text] Entrusted by the State General Administration of Computer Industry,
10 organizations sponsored an appraisal meeting in May 1981 to evaluate Shang-
hai Computer Plant's first DJS220 machine, and the extended FORTRAN language
jointly developed by Beijing University and Shanghai Computer Plant, The 10
organizations included Shanghai Computing Technology Research Institute,
Huabei [North China] Computing Technology Research Institute, and the Comput-
ing Technology Institute of the Chinese Academy of Sciences.

The evaluation test for DJS220 consisted of the following two items: First,
to test its parallel processing capability for supporting multiple channel/
multiple equipment operations; a total of 31 activate-equipment test runs were
conducted with no breakdowns or jitters, requiring only one startup. Second,
to test the stability of the overall machine in serial operation; the tests
also resulted in no breakdowns or jitters, requiring one startup only and 50
hours of stable run. After the evaluation tests, the computer continued to
run over 50 hours with all kinds of equipment online.

Prior to its evaluation test, the extended FORTRAN language had already been
used in 144 test problems, including 115 NBS FORTRAN test programs. A total
of 18 formal test problems were tried on the compiler system, which consisted
of the following two portions: First, emphasis was placed on testing its
basic capabilities, using most of macro-instructions and related job instruc-
tions under the DJS22/XT1G operating system, and putting the machine through
four job modes: direct-access single channel, single channel load job, single
channel input, multiple channel input, Second, test the use of different
types of files, interrupt/continuous processing, multiple target linking
loader, and the main functions of its compile debugging and run debugging. The
test results were all positive and proved that the extended FORTRAN language
was of fairly good quality and had relatively strong capacities as well.

9119
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IMPROVED VERSION OF DJS-6 DEVELOPED IN HUNAN

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 17, 5 Sep 81 p 1

[Article: "Hunan Successfully Develops Improved Version of DJS-6 Computer: DJS-6-J"]

[Text] On the basis of the DJS-6 (108B) computer, the Hunan Province Radio Plant recently developed the DJS-6-J machine. Due to the extensive use of new components and new technologies, the size of this model is only one-third of the prototype machine while its speed has been increased nearly three times; its main memory has been expanded two or four times, and its system capability has been enhanced as well. It has passed the evaluation tests, and is approved for small volume production.

The DJS-6-J uses dual-in-line medium/small scale integrated circuit components, the main frequency has been increased to 2 MC; the main memory can reach as much as 128 kilobytes. Its access time cycle is reduced to 2 microseconds; and the machine can support up to eight peripherals. One of the characteristics of its design is the elimination of such auxiliary equipment as dedicated line transformer, intermediate frequency generator, and high-power air conditioning unit. Steps have been taken to enhance the machine's adaptability, and it can operate in 10-30 degrees Centigrade temperature environment, and run on 150-250 volts city power.

DJS-6-J's instruction system is compatible with that of 198B. It has altogether 64 operation codes, 4 classes of and 13 types of addressing modes; the software is compatible with the prototype machine, and the technical documentation is fairly complete.

The current price of this machine is approximately 400,000 yuan.

9119
CSO: 4008/98

- 35 -

DJS062 SERIES, NEW LSI COMPONENTS INTRODUCED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 20, 20 Oct 81 p 1

[Article: "Liaohe Experimental Research Institute Introduces Newly Developed Microcomputers and LSI Components"]

[Text] The Liaohe Experimental Research Institute organized a special evaluation meeting in Shenyang last September to introduce some of its research results. Twenty-six items were submitted for evaluation, including microcomputers and LSI components, most of which had reached national advanced level.

Among the various products, there were four microcomputer models, i.e., DJS062-A,B,C,D which were totally composed of LSI components developed and manufactured by the institute. Each model supports the following peripherals produced by the institute: CYD-1 and CYD-2 matrix printers, and CZX-1 and CZX-2 CRT display units, as well as cassette recorders available on the market. Models A, B and D are single-board machines; model C is a computer system configuration with such mainframe software as LOS-2 monitor program, resident assembler, resident counter-assembler, and BASIC interpreter. All four models have fairly strong capabilities and are easy to operate.

There were eight types of NMOS large scale integrated circuits which were tested during the evaluation: microprocessor unit MPU, asynchronous series communication interface ACIA, synchronous series data interface SSDA, parallel/general-use peripheral interface PIA, and 1 K static RAM, 8 K EPROM, 8 K ROM, and 128C x 7 x 5 character generator. New technologies and computer-aided board manufacturing techniques were extensively employed in producing the preceding parts, e.g., isopolar ionic implantation, LPCVD, parallel seam welding, dry etching, electron beam evaporation, etc., which produced high product-yield rates and excellent reliability. The products, moreover, are compatible with American-made M6800 parts.

9119
CSO: 4008/98

DJS-240, 260 PASS EVALUATION TESTS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 21, 5 Nov 81 p 1

[Article: "DJS-240 and 260 Passed Evaluation Tests"]

[Text] DJS-240 and 260 are medium and high grade models in the 200 family of computers, and are suitable for scientific computation, real time control and data processing. Designed by the 200 Series Joint Designing Group and manu- factured by Huabei [North China] Computing Technology Research Institute, the first two 260 machines passed the evaluation tests on 11 August 1979, and have been delivered to users. The third and fourth 260 machines as well as the second and third 240 machines are now being assembled. Up to now, all four models in the 200 series, i.e., DJS-210, 220, 240 and 260, are available to users. The main frequency of the 240 model is 3.3 MC; the timing of various basic instructions falls within 0.6-6.6 microseconds; the machine has 187 in- structions; the maximum capacity of its main memory is 32 K double word x 8; it has a total of 180 subchannels, and can support at most 240 I/O equipment. It supports a fairly complete range of peripherals. All system software is upward compatible and supports the DJS-200XT1, XT2, XT3 operating systems, the DJS-240/260 real time operating systems, DJS-200 supervisor, and all kinds of high level languages.

The 260 model's main frequency is 4 MC; the timing of its basic instructions falls within 0.25-3.75 microseconds; it is equipped with 187 instructions. The maximum capacity of its main memory is 32 K double word x 4; its channels, peripherals and software support are basically the same as the 240 model.

Chinese-made small scale integrated circuits are installed in the 200 series computers. Practical use has proven that Chinese-made integrated circuits are completely suitable for fairly stable medium and large frame computers. For example, when the first 240 machine was being assembled, a total of 53,150 components of 11 different varieties had to be tested and screened prior to the installation. Only a small number of circuit chips had to be replaced due to early failure; other than that, the machine has now run 6,000 hours with basically no component replacements. The machine was put to 150 hours of continuous running test, and manually stopped. The users are very satisfied with the stability of the 260 model.

To improve the mainframe speed of DJS-240 and 260, besides proper use of parallel operation and concurrent operation, a certain degree of high speed operation was used, e.g., 12 digital multiplication and iterative division in the 260 machine; 8 digital multiplication and iterative division in the 240 machine, etc. Moreover, the pipeline technique was used in the 260 model, and more than one-half of the instructions could complete preprocessing and processing within 250 nanoseconds. Thus, the average operation speed of DJS-260 exceeded 1 million operations per second, and the operation speed of 240 reached 500,000 operations per second.

9119
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ZPC-2 FLOPPY DISK DRIVE PASSES EVALUATION TESTS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 12, 20 Jun 81 p 10

[Article: "ZPC-2 Floppy Disk Drive Passes Evaluation"]

[Text] Developed and manufactured by the Suzhou Electronics Equipment Plant in Jiangsu Province, the ZPC-2 8-inch single-side single-density floppy disk passed the evaluation tests at a design finalization meeting held last May in Suzhou.

The participants at the meeting agreed that as far as use and machine testing were concerned, the ZPC-2 floppy disk drive's work stability and reliability had reached the requirements for actual use, and the drive is compatible with IBM3740 format.

The ZPC-2 floppy disk drives use steel belts to move and position magnetic heads. This type of structure had been quite successful, i.e., it not only enhances the accuracy of positioning, but also increases the speed of allocation, thus resulting in excellent performance/cost ratio.

The magnetic head of the disk drive is up to the domestic advanced level in electric performance, smoothness and wearability, and the factory that produces the heads has solid technological basis. The Suzhou Electronic Equipment Plant is totally equipped with Chinese made devices and materials. The successful development of the ZPC-2 floppy disk drive is the result of combining learning from advanced foreign technology with tapping the factory's own creative force. It is also the result of disciplinary coordination.

9119
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32 KILOBYTE CORE MEMORY MODULE PRODUCED

[Article: "32 Kilobyte Core Memory Module, Price Below 20,000 Yuan"]

[Text] The Shazhou Computer Plant in Jiangsu Province has developed and manu-
factured 2 microsecond 32 kilobyte core memory modules which passed evaluation
tests conducted in Suzhou recently.

The participants at the evaluation session agreed that the core memory modules
had excellent peripheral circuit design, reasonable and compact layout, and
relatively good adaptability to environmental temperature. The low cost, in
particular, won attention. The retail price is less than 20,000 yuan, and the
performance/cost ratio is relatively high. The product should be popularized
in all kinds of minicomputers. The read/write common-drive scheme of the
module produces excellent results. This is China's first-ever success in
using 16 K single sense-wire designing technique. The experiences are useful
for designing medium speed large capacity core storage modules.

9119
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MODEL 6500 COLOR GRAPHIC PRINTER DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 12, 20 Jun 81 p 10

[Article: "Color Graphic Printer"]

[Text] Xerox has announced the successful development of Model 6500 color graphic printer which reportedly uses laser scanning and dry printing techniques and can print color graphs within a few seconds. The output rate is 3.2 copies per minute for panchromatic graphs and 9 copies per minute for monochromatic graphs.

This type of printer belongs to the grate-scanning printer system which converts serial computer input data into color graphs at a resolution of 100 dots per inch. The maximum breadth of a graphic printout is 6.4 inches, and the length is 13.75 inches. The unit price is $30,000.

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HUNAN PRODUCES GTX-2 COLOR GRAPHIC DISPLAY UNITS

[Article: "GTX-2 Light-Pen Color Graphic Display Units"]

[Text] The GTX-2 color graphic display is one of the major scientific research
projects in Hunan Province. Development of the system began in 1978 when the
Changsha Engineering College undertook the design work and the Hunan Province
Radio Plant carried out the trial manufacturing phase of the project.

The GTX-2 color graphic display is a complete intelligent terminal system com-
posed of two major units: The control unit includes a DJS183 general-purpose
versatile minicomputer equipped with such peripherals as hole puncher, paper
tape input and punch controller. The computer serves both as the control unit
of the GTX-2 color graphic display system and as an independent computing system
for scientific computation and data processing. The graphic display unit is
composed of CRT display, light pen, trace ball, keyboard and camera. Con-
trolled by the DJS183 multipurpose computer, the color graphic display system
features powerful graphic processing capabilities with the support of light
pens, keyboards and trace balls; the system can display graphs and characters
in four different colors with relatively high display rate. It is also
equipped with a camera to photograph images on the screen. The display system
is an ideal intelligent I/O device with complete functions.

Following are the chief technical characteristics of the system:

1. Control Unit

The DJS183 computer includes such features as single bus structure, hardware
stack, multiple interrupt mosaic; clock frequency $\leqslant$ 500 nanoseconds; internal
storage capacity 28 kilobytes (word length 16 bits) expansible; internal memory
read/write period < 2 microseconds.

2. Display Unit

CRT: Transmission-type 4-color display tube; effective display area;
26 cm x 26 cm; frame frequency: 50 Hz; display colors: red, orange, yellow
and green; full-frame displayable vector length: 30 meters; full-frame dis-
playable character set: 1,500-2,000 characters; generated character set:
96 ASCII characters; display unit clock frequency: 8 MHz; color switchover

time < 100 microseconds; brightness levels: very bright, bright, dark; light pen: computer-controlled tracing; viewing zone: 3 mm; keyboard: 52 character keys, 40 function keys, 12 operation keys; trace ball: outputs data on X, Y, Z coordinates, data in all three directions can be output separately or simultaneously; camera: manual-controlled or program-controlled picture taking modes.

On 4 March 1981, the Hunan Provincial Bureau of Electronics Industry jointly sponsored a GTX-2 evaluation meeting participated in by experts, professors, engineers and technicians from 20-odd organizations inside and outside the province.

Prior to the meeting, the Hunan Radio Plant and representatives from GTX-2 user organizations had conducted a test run which lasted for 100 consecutive hours without malfunction. During the meeting, the participants conducted a careful and comprehensive technical examination of the machine and unanimously reached the following conclusion: the GTX-2 color graphic display system is equipped with complete technical files; can clearly display 4-color graphic images; powerful anti-interference capability; excellent stability and reliability; meets strict technological requirements; aesthetically well-designed structure; all technical specifications meet design requirements and are up to the advanced level of domestically manufactured products of the same category. Equipped with all necessary functions and capabilities, the system is extensively used. In engineering design and scientific research work, it can be used as stand-alone equipment for such operations as graphic data processing and graphic display aided designing; it can also be used in any monitoring system which requires graphic displaying. In traffic control, it can be used for displaying on-the-spot vehicles and installations; the graphs are vivid and direct, which makes work easier for the traffic controller.

In order to further improve quality, reduce size and cut down cost, the Changsha Engineering College and Hunan Radio Plant have decided to replace DJS182 with DJS062 microprocessor as the control unit of the display system.

9119
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1,000 MHZ HIGH-SPEED COUNTER TECHNOLOGICAL BREAKTHROUGH

[Article: "Shanghai Radio Instrument Plant Achieves Breakthrough in 1,000 MHz High-Speed Counter Technology"]

[Text] High-speed electronic counters not only can measure a wide range of frequencies, but also random pulses. Moreover, on the basis of this high-speed technology, the upper limit of frequency measurement can be further extended. Thus, the development of high-speed electronic counters has already become a major aspect of the electronic counter field. At present, only a handful of countries have succeeded in breaking through this kind of technology.

Through over 1 year's effort using conventional printed circuit technology and discrete components, the Shanghai Radio Instrument Plant scored a breakthrough in the 1,000 MHz high-speed counter technology and developed the Aishi Brand S810-Type electronic counter of up to 1,000 MHz direct counting. This type of machine is characterized by the following features; wide frequency measurement range, high level of sensitivity, high speed, high level of precision, resolute display, stable and reliable, easy to operate, etc. The design was finalized in late 1980 when it won fairly good commendations.

The S810 electronic counter has the following characteristics--frequency measurement range: 10 Hz to 1,000 MHz; input channel impedance: 50 ohms and 1 megaohm; period measurement range: 1 microsecond to 10 seconds; frequency ratio measurement range: 10/1 to $1^{-1}/1$; frequency measurement sensitivity < 100 MV (rms), the sensitivity at frequency measurement range of 10 MHz to 1,000 MHz can be increased to 100 MV by adding on an S00001 Model high sensitivity amplifier; standard frequency: 5 MHz; daily frequency stability 5×10^{-9}; output voltage: > 0.5 V/1 kiloohm; daily base frequencies: 0.1, 1, 10, 100, 1,000 Hz; output voltage: 3V(P-P)/1 kiloohm. The counter also has reset input ports for outside connection and 1, 2, 4, 8 encoded outputs, which enables printing and logging of measurement results, as well as handling random tests in conjunction with the system. The factory has also conducted environmental tests on the machine, and the results have reached previously set technical targets.

9119
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JINZHOU COMPUTER PLANT IMPROVING PRODUCT QUALITY

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 13, 5 Jul 81 p 3

[Article: "New Supply-Demand Relations Geared to User Needs; Jinzhou Computer Plant Takes Steps To Ensure Normal Operation"]

[Text] It has been almost 8 months since the Jinzhou Computer Plant delivered its product, the DJS140, to the Shandong Institute of Oceanography. To improve the quality of its products and expand the range of application, a meeting was held on 14-16 June at the Shandong Institute of Oceanography in Qingdao to evaluate the application performance of DJS140. At the meeting, representatives of the Institute of Oceanography gave introduction presentations on the selection, installation, as well as the application of their DJS140. Their presentation included an account of how they managed to set the entire system into normal operation in only 5 and a half hours after unpacking the machine. Their presentation was well received at the meeting.

The Jinzhou Computer Plant gave an outstanding presentation at the meeting. After introducing the characteristics of their product, they assured the users of their guaranteed products with the following solemn oath: All requests will be complied with and all questions will be answered and they will be on call at any hour and assume full responsibility. Actually, this was exactly how they had conducted business with the Institute of Oceanography. The representatives praised this kind of spirit and described it as a challenge to the current "bureaucratic business style." It is a new business style that deserves recommendation. This kind of business practice has won the confidence of the users. At the meeting several organizations expressed desire to discuss business with the manufacturer.

The DJS140 system produced by the Jinzhou Computer Plant has withstood thousands of hours of test runs; the machine quality has reached the domestic advanced level. It has been running normally for the past 8 months, and has processed a host of scientific research computation problems without a single hitch.

9119
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DJS100 SERIES PRODUCTS EXHIBITED AT SALES SHOW

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 17, 5 Sep 81 p 4

[Table: "100 Series Products Exhibited at Computer Sales Show"]

[Text] 100 Series Products at Computer Sales Show

Model	Chief Technical Specifications	Manufacturer(s)
DJS101	Word length: 16 bits Internal storage: 8-32 kilobytes Fixed point addition: 400,000 oper/sec	Science Education Instruments Plant of Huadong Normal Institute
DJS112	Word length: 16 bits Internal storage: 4-32 kilobytes (MOS or magnetic core Fixed point addition: 500,000 oper/sec	Shaoguan Radio Plant, Changzhou Radio Plant No 2
DJS130	Word length: 16 bits Internal storage: 32 kilobytes Fixed point addition: 500,000 oper/sec	Suzhou Computer Plant, Weifang Computer Plant, Beijing Computer Plant No 3 Tianjin Electronic Instruments Plant Tianjin Radio Plant No 2
DJS131	Word length: 16 bits Internal storage: 32 kilobytes Fixed point addition: 500,000 oper/sec Multiplication/division hardware, page protection units.	Shanghai Computer Plant
DJS132	Improved version of DJS130 with more capabilities/units: multiplication/division, automatic bootstrap, page protection, hardware self checking, odd-even checking; power drop protection automatic restart units	Tianjin Radio Technology Research Institute Tianjin Electronic Instruments Plant Suzhou Computer Plant

[continuation of Table]

Model	Chief Technical Specifications	Manufacturer(s)
DJS135	Reinforced structure; three protective measures; temperature range: -15 to 45°C; rest same as DJS130	Tianjin Radio Plant No 2 Yunnan Electronic Equipment Plant
DJS140	Word length: 16 bits Internal storage: 64-128 kilobytes Fixed point addition: 800,000 oper/sec Floating point (64 bits): 500,000 oper/sec Equipped with floating point unit, multiplication/division hardware, memory management protection unit, duplex machine and duplex work units	Beijing Computer Plant Jinzhou Computer Plant Liaoyuan Radio Plant No 3
DJS153	Word length: 16 bits Internal storage: 32-128 kilobytes Fixed point addition: 1-1.4 million oper/sec Floating point (64 bits): 500,000 oper/sec Equipped with floating point computation, memory supervisor protection, hardware stack, odd-even checking units; Two kinds of memory; magnetic core and MOS	Tianjin Radio Technology Research Institute Taiyuan Dazhong Machinery Plant Suzhou Computer Plant Weifang Computer Plant Tianjin Electronic Equipment Plant
DJS184	Word length: 16 bits Internal storage: 32-128 kilobytes Fixed point addition: 400,000-500,000 oper/sec Equipped with magnetic core and semiconductor memories which can be used together and furnished with memory supervisor and decimal system units	Huabei Computing Technology Research Institute
DJS185	Word length: 16 bits Internal storage: 32-124 kilobytes Fixed point addition: 500,000 oper/sec Equipped with magnetic core and semiconductor memories which can be used together; has floating point computation and internal storage supervision units	Shanghai Computer Plant

SJ-77 COMPUTER SYSTEM FOR NETWORK COMMUNICATION

[Article by Liu Shanlin [0491 0810 2651], Shanghai Computing Technology
Research Institute: "Characteristics of the SJ-77 Computer System"]

[Text] In accordance with the requirements of data processing application
systems, the Shanghai Computing Research Institute has developed the SJ-77
computer, a data processing machine designed chiefly for real time processing
to be used in network communication. Moreover, the mainframe has been inno-
vated and expanded into the 77 series system. Emphasis is placed on applica-
tion in the system design, especially the machine's instruction system, inter-
rupt system, main memory management, input/output system, and communication
control. Through debugging and evaluation, the system is found to have the
following performance characteristics:

1. Multi-user/multi-job system: The system supports multiple work terminals;
each unit is equipped with a keyboard display terminal or Type-55 typewriter
terminal. The terminals can perform different jobs simultaneously, and can
operate in foreground/background mode.

2. Equipped with communication control unit which supports several simul-
taneously-controlled speeds: The system's communication control unit can
support terminals of varying baud rates. One communication control unit can
control four baud rates: 50, 75, 100, 200; it can also control 16-channel
half duplex or 8-channel full duplex communication lines.

3. Automatic reentrant routine: Can increase the utilization rate of the
main memory and reduce I/O load.

4. Vectored Interrupt: The system provides 6-level automatic vectored in-
terrupt and hardware protection and restore command; it can protect all kinds
of contents according to the cause of various kinds of interruption, thus
accelerating the handling of interruptions. The I/O system provides data
chaining and command chaining functions for executing channel programs, thus
improving the system's operation efficiency.

5. Independent I/O standard interfaces: Information can be directly put into
or retrieved from the memory by the I/O standard interfaces without CPU inter-
vention, thus enhancing the throughput of the overall system.

6. System expansibility: The modular structure of the internal memory and I/O enables flexibility in system support. The traditional I/O design has been modified to support various kinds of peripherals used by online users, thus furnishing users with possibility of expanding or renewing their own equipment.

7. Availability: String length modification instructions can be interrupted, thus enhancing system availability.

8. Reliability: The mainframe supports three kinds of modes, i.e., kernel mode, supervisor mode and problem mode, as well as eight circular protective levels; it also separates the spaces occupied by the instructions and data of each mode, thus preventing interprogram destruction. The internal memory provides Hamming-type verification; magnetic tape drives employ cyclic code checking method; data channels use byte odd-even checking method. Furthermore, the following technologies are also used for enhancing reliability: different kinds of matching, vibration elimination, filtering and printed circuit base board, etc.

SJ-77 series machines have 16 bit memory; the actual addressing capability of the main memory can be expanded to 256 kilobytes. At present, two types of models have been developed to 256 kilobytes. At present, two types of models have been developed: SJ-771 and SJ-773. The system is already being successfully applied in "artificial intelligence computer application systems for Chinese traditional medicine" and "inventory control application systems."

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TP80TS MICROCOMPUTER EDUCATIONAL EXPERIMENTATION SYSTEM

[Article: "Beijing Industrial University Successfully Develops TP80TS Micro-computer Educational Experimentation System"]

[Text] Recently, to meet the need for experimentation courses in higher educational schools, the Microcomputer Teaching/Research Group in the Computer Department of Beijing Industrial University successfully developed and installed a microcomputer system for conducting educational experiments. The system's mainframe consists of TP801-Z80 single board computers produced by the Electronic Plant of Beijing Industrial University; it uses imported DIP standard socket boards and almost 30 imported IC chips designed for experimental work (including A/D, D/A converters, single chip sampler/maintainer, 2114 static RAM and some 74-series integrated circuits). With this type of system, it is possible to perform various basic experiments involved in logic circuit and microcomputer courses as well as basic experiments demonstrating the use of microcomputers in all kinds of automatic control systems. The Teaching/ Research Group has now developed 10-odd experiment packages for the system, and compiled a set of teaching materials complete with detailed instruction on the experiments. The educational experimentation system not only meets the experimentation needs of college and university students who are taking related disciplinary courses, it is also of practical value to scientific research organizations as well as factories, mines and enterprises which require the application of microprocessors.

In an effort to solicit suggestions from various fraternal universities and colleges, the Beijing Industrial University will hold an evaluation meeting on campus on 26 September to finalize the prototype TP80TS educational experimentation system. Ten TP80TS systems will be exhibited at the meeting and the participants can use the systems to try all kinds of experiments. The experiment instruction materials will also be available for examination and revision. Other exhibits will include TP801 single board models and the prototype TP803 microcomputer jointly developed by Beijing Industrial University and the Hong Kong Jingye Company.

9119
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GTX-A LIGHT PEN GRAPHIC DISPLAY DEVICE DEVELOPED

[Article: "Successful Development of GTX-A High-Speed Light Pen Graphic Display Device"]

[Text] The Automation Research Institute of the Chinese Academy of Sciences and Tianjin Radio Plant No 2 have developed and produced GTX-A high-speed light pen graphic display devices which use uniform speed analog lining technology. In August, an evaluation meeting was held in Tianjin. The GTX-A is suitable for displaying complicated diagrams used in computer-aided designing, control command centers, etc. It is useful for generating multi-quantum pattern mosaic as well as other kinds of man-machine interactive systems. With the exception of RAM, EPROM and computing amplifier, all the components of the GTX-A are produced in China. GTX-A has been successfully tied into DJS130 computer systems. The device has now reached the following targets: employs Chinese-made 43SS82D display tubes, 1024 x 1024 grating unit screen, can be expanded to upper semicircle and right semicircle, random scanning, 4-level brightness plus scintillation, frame frequency 30 mS; uniform velocity analog lining generator; point-to-point beam movement stabilization < 20 mS, the lining of each frame can reach 120 m, 3,000-6,000 short lines; 4 kinds of line patterns, 7 kinds of scales, 6 kinds of rotations; the character generator has the capability to produce 4 different fonts, 2 rotations, as well as superscripts and subscripts. Altogether, it can generate 242 different kinds of characters (English, Greek, numerals, letters, symbols and Chinese characters). It has 31 command systems, and such man-machine interactive means as light pen, keyboard, and coordinate locator. It is equipped with photoelectric device and audio cassette drive; the display unit's EPROM uses paper tapes or magnetic tapes as input/output means for program preparation; command memory debugging program; the light pen generates tracing programs and offline graphic processing programs. The uniform speed analog lining scheme adopted in GTX-A is the first of its kind in China, and its lining length can reach 120 m. At present, it is an advanced model among various computer graphic display systems in our country.

This type of display device will be produced on a small scale by Tianjin Radio Plant No 2.

9119
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HUABEI TERMINAL EQUIPMENT COMPANY FOUNDED IN BAODING

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 21, 5 Nov 81 p 11

[Article: "Huabei Terminal Equipment Company Founded in Baoding"]

[Text] The Huabei [North China] Terminal Equipment Company was founded on 6 October in Baoding by incorporating the state-owned Jianshan Machinery Plant and Hebei's Baoding Electronic Instruments Plant. This particular joint venture between national and local enterprises was achieved on the principles of voluntary participation and mutual benefit. Li Rui [2621 3843], director of the State Computer Industry Administration, was present at the inauguration ceremony.

The Huabei Terminal Equipment Company is the first firm in China which specializes mainly in the production of computer terminals; it is well equipped and has relatively solid technical force with many years of experience in manufacturing computer peripherals. The establishment of the company is conducive to the serialization and specialization of terminal production, as well as the quality improvement and massive specialized production of its products.

The Huabei Terminal Equipment Company follows the system of job responsibility assumed by managers under the supervision of the board of directors. The company is composed of a Technical Development Division, a Production Planning Division, a Marketing/Support Service Division and a Treasury/Supply Division. The Technical Development Division will devote its efforts to designing and trial manufacturing new products as well as the development of technology in such areas as Chinese character intelligent terminals, all kinds of CRT display units, DJS060 series microcomputers and single board computers. The Marketing/Support Service Division will provide users with maintenance and technical training service.

Located in Baoding City, Hebei Province, the Huabei Terminal Equipment Company currently provides users with ZD-2000 Chinese character intelligent terminals, ZD-1110, ZD-1220 character display units, and MC6800 series single board machines.

9119
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DJS132-3 MINICOMPUTER STRONGPOINTS OUTLINED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 20 Nov 81 p 1

[Article: "DJS132-3 Minicomputer With Powerful Capabilities and Excellent Performance/Cost Ratio"]

[Text] Displayed at the National Computer Sales Show, the DJS132-3 computer won wide attention with its powerful capabilities and high performance/cost ratio.

The DJS132-3 model is the improved version of DJS130. It makes full use of the comprehensive and rich library of system software. Moreover, it has overcome DJS130's poor reliability and performance/ratio.

Thus, it not only has won excellent commendations from domestic users, but also the attention of foreign computer industrial circles. The head of the Japanese Overseas Information Prmotion Center's visiting delegation to China said: "The DJS132-3 minicomputer can compete in the international market."

The chief strongpoints of the DJS132-3 model are:

(1) Powerful hardware capabilities. Basic components include multiplication/division hardware, storage page protection, real-time clock, hardware diagnostic system for operational control and main storage. Besides the original three basic interfaces, a variety of additional interfaces have been installed for console monitor typewriter, wire printer, line printer, character display, plotter, etc.

(2) Excellent expansibility. The model employs standard bus organization, modular racks, modular cases and interface bus structure. It is basically equipped with such characteristics as optional plug-in units, optional plug-in positions, multiple case expansibility, and optional system expansibility. All of the above can be achieved without adding extra equipment.

(3) System hardware compatible with NOVA1200: Equipped with 40-odd diagnostic programs for hardware system checking, as well as rich library of software; also characterized by flexibility in operational use (has Assembler, BASIC, ALGOL, FORTRAN-IV, etc.); great variety of service programs which are economic and applicable.

(4) Excellent reliability: Equipped with U.S. standard SN74 series devices and internally optimized LSI components; supports optimized and reliable peripherals. Such new technologies as printed backplate wiring, computer-aided photo repeat, printed board negative lead-tin alloy plating, silk screen printing method of characters. The structural design is compact and reliable, which not only enables expansibility and maintainability, but also makes production and use easy.

High Performance/Cost Ratio: As described above, the DJS132-3 minicomputer has many characteristics; yet, it is also relatively low cost, which means better performance/cost ratio. This is exactly why it is widely well received.

9119
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CHINESE CHARACTER DOT MATRIX TYPE BASE

[Article by Lu Guangmao [1776 1684 2021]: "General Purpose Chinese Character Dot Matrix Type Base"]

[Text] In order to bring about computerized processing of information in Chinese characters, it is imperative to first develop a digital Chinese character type base. But this requires a tremendous amount of work; if various organizations engage themselves in such an undertaking, it will not only result in redundancy of efforts, but also poor compatibility and uniformity, thus causing the need for unification.

For this purpose, the State General Administration of Computer Industry summoned a meeting in Beijing last September to evaluate the 16 x 15 Chinese character dot matrix type. The meeting focused on the standardization of and typefaces for Chinese character dot matrix types, as well as rules for simplifying multiple-stroke characters. Special emphasis was placed on the representation of typical multiple-stroke characters of the 16 x 15 dot matrix type, and the establishment of standard character forms.

"The Chinese Character Dot Matrix Type Regulation" establishes the 16 x 15 and 24 x 22 dot matrix types as standard forms, and specifies the definition of dot matrix types and description of dot matrix type bytes. The character forms of the 24 x 22 dot matrix type are based on the Song [Dynasty] typeface, and are basically capable of representing words in the "Chinese Graphic Character Code Set for Information Interchange (Primary Set)." But due to the fact that the representation of each word requires an enormous amount of information for this particular type of dot matrix, the word library requires fairly large storage capacity. Thus, this type of dot matrix is used only for relatively high quality printing, such as the printing of formal files with wire printers for office file management, etc.

The character forms in the 16 x 15 dot matrix type are based on boldface type, and can represent the overwhelming majority of words in the "Chinese Graphic Character Code Set for Information Interchange (Primary Set)." As only a small amount of information volume is required for the representation of each word with this type of dot matrix, the word library requires smaller storage

and costs as well, which is suitable for popularization. Multiple-stroke Chinese characters can also be expressed through proper and minimal amount of simplification. "The Chinese Character Dot Matrix Type Regulation" establishes rules for the simplification of such characters of the 16 x 15 dot matrix type. It is suitable for such applications as business processing, inventory control, enterprise and business management, information retrieval, etc. It will not be long before the preceding standardized general-purpose Chinese character dot matrix types will be formerly released to users, and the software will be supplied in various forms for the users to choose from, i.e., ROM, punched tapes, floppy disks, etc.

9119
CSO: 4008/98

DEVELOPMENT OF DJS100 SERIES REVIEWED

[Article by Lu Wenchao [0712 2429 6389] and Chen Zhengqing [7115 2973 3237]: "Development of the DJS100 Computer Family"]

[Text] Since 1973 when our country decided to develop series computers, the growth of the DJS100 family has been fairly successful. The first DJS130 machine was evaluated in August 1974; up to now, nine different types of models of various sizes have been introduced into the DJS100 series. Moreover, some 700 machines have been produced and are currently in operational mode; they account for approximately one-fifth of the total number of computer machines in China, which is unprecedented in the entire history of the development of computers in our country. In retrospect, we are convinced that so long as our computer industry is developed in line with the actual conditions of this country, it will certainly grow and flourish. As this is exactly how the DJS100 series has been developed, it definitely holds bright prospects ahead.

Seven Years Development

The DJS130 model was first developed in 1973; following its evaluation tests in August 1974, Beijing, Tianjin, Shanghai, Jiangsu and Shandong began to produce this model, and within the short span of a few years, several hundred machines were produced and marketed. Although the DJS130 model was produced on a modest scale in the early period and its peripheral/software support was still incomplete, it was nevertheless an excellent beginning. Subsequently, the series began to develop towards the lower end of the DJS100 line: DJS110, 112, 102 and 101; along the same level as DJS130: DJS131, 132 and 135, as well as upwards: DJS140 and 153. By August 1979 when the DJS140 computer system was certified for production, the DJS100 series had already expanded into a complete family of computers. In 7 years time, tremendous progress had been achieved in all areas from component to mainframe, from peripheral to software, and from system to application.

The types of integrated circuits installed in the DJS130 model then were single or double gate flat packages; even single D-type flipflops and quadruple NAND gate circuits were all in the preliminary experimental stage. By the time DJS140 emerged on the drawing board, 10-odd medium scale integrated circuits (DIP) were employed, e.g., 4-digit arithmetic units, 4-digit shift

registers, 4-digit multiplexers, etc., and the degree of integration had been increased 4-10 times. Although it has taken quite some time to develop the devices, it is now possible to mass produce complete sets of high-quality medium scale integrated circuits, which is quite essential for ensuring the reliability of mainframes.

The mainframe of the DJS130 prototype model only had 16 kilobytes of internal memory. But its main memory went up to 64 kilobytes in no time. The reliability index of the DJS130 model in its early phase of production was evaluated at 50 hours; by 1980, the evaluated index was 500 hours. Now some factories can produce machines with reliability indexes up to 2,000 hours.

The central processing unit of the DJS140 model has its own multiplication/division hardware component as well as 64 bit double precision high-speed floating point unit (FPU); it has accuracy up to 15th effective decimal digit; its speed in floating point computation is 50,000 operations per second. It is also equipped with memory management paging unit (MMPU) for running multiple programs; the main memory is 128 kilobytes and expansible to 256 kilobytes. The mainframe of the DJS140 model is equivalent to approximately 2.5 times the scale of DJS130, and its scientific computation and real-time processing capabilities are vastly improved. In August 1979, when DJS140 underwent evaluation tests, the reliability index was 200 hours; recently, the reliability tests of factory products exceeded 1,000 hours.

The early DJS130 model machines did not have such peripherals as magnetic disk drives or 8 unit console typewriters, which affected software support. Both DJS140 and the recent model of DJS130 can basically support general-use peripherals. The recent version of DJS140, for example, can support 4 cartridge disk drives, 2 magnetic tape drives, 2 console terminals, 4 user terminals, 1 line printer, 1 plotter, 1 punch tape input unit, and 1 punch tape output unit, which is quite sizable in scale. Improvements have also been made in the quality and reliability of peripheral products. For instance, the exchangeability of magnetic tapes is now feasible and no longer a problem as it used to be for a long time in the past. The recent file exchanges between DJS140 and imported NOVA-3 machines were achieved through magnetic tape media.

In the early days, the software of DJS100 series used to reside in stand-alone punch tape systems, which, to a certain extent, limited the capabilities and application of the machines. In August 1979, the newly emerged DJS140 model had a complete set of system software with a disk operating system at the core. Subsequently, DJS130 and 131 were also upgraded with disk operating systems. Today, the DJS100 series has a rich library of softwares. For example, the DJS140 model is equipped with a very powerful MRDOS operating system, the latest version of real-time FORTRAN 5, real-time FORTRAN IV, ALGOL, BASIC and other high level languages; it also has editor, multiple user editor, assembler, macro assembler, batch processing and other utility programs. Not long ago, COBOL and PASCAL also became part of the software system which can now adequately support all kinds of needs for developing application programs.

Not long ago, some 60 problems were used to run comparison tests of the operating systems of DJS140 and NOVA-3 as well as their capabilities to support

programming languages. The computation results on both machines were exactly the same, and the speeds were basically 1:1.2. The hardware and software support of both machines were basically identical. This showed that the gap between minicomputers produced in China and foreign countries was gradually reducing.

Urgent Tasks

The hardware/software support of the DJS100 series is now fairly complete, and the mainframe stability has been improved considerably. Under such circumstances, emphasis should be placed on improving the entire system's reliability and resistance to interference, and enhancing the entire system's restoration capability in the event of malfunction, thus advancing towards the major goal of quality improvement.

In recent years, China's computer industry has had some setbacks in production, although it has strong potentialities. The marketing of computer products, moreover, also suffered from losses. This is directly attributed to the lack of extensive computer application in China as well as limited markets and high prices. On the one hand, there is an urgent need to consolidate bases which have been achieved thus far, improve the quality of products, lower costs, and enhance the performance/cost ratio of products; on the other hand, it is also imperative to popularize computers and open up new fields of computer application. The foregoing two tasks are linked to each other, but special emphasis should be placed on the former in order to facilitate the development of the entire computer enterprise.

(1) Multi-Terminal Computer Training Systems

Schools of higher education should set up multiple terminal computer training systems so that students can have the opportunity to take computing courses and take up design work projects as part of their course and graduation assignments. The faculty, moreover, will also have the opportunity to apply computers in scientific research work. This is especially important for training top-quality construction personnel and the popularizing computer application. Last year, the Zhengzhou Engineering College developed a DJS130 multi-terminal computer teaching system which attracted wide attention among various organizations. In other parts of the world, some economically developed countries have established four major targets for gauging the level of universities and colleges, i.e., computer, teaching force, library and laboratory, which merits our attention. Today, DJS130 and 131 training systems, as well as the DJS101 training system which is even more inexpensive, have been developed in this country. We are also currently in the process of setting up a DJS140 training system which will have even more powerful capabilities, i.e., besides multiple-user BASIC, it will also support multiple editing and batch processing programs; users can simultaneously enter and edit any kind of source language through their terminals, and the operating system can perform batch processing. This way, students will not only be able to learn BASIC, but also master the operating system and other high level languages.

At present, schools of higher education are inadequately funded, the state and concerned departments should take certain preferential measures (including payment by installments) to encourage them to use computers.

(2) Engineering Computers and Scientific Computing Systems

As large frame machines are fairly expensive in our country, quite a few organizations cannot afford to purchase such equipment. This is where the DJS100 series can play a useful role in facilitating the use of engineering and scientific computer systems. The upper end of the DJS100 series, in particular, are equipped with high speed and high precision floating point computation components, as well as highly optimized compiled programs written in FORTRAN-5. The machines have expansible internal memories and can take on fairly sizable computation problems. At present, DJS100 series manufacturers are trying to develop array processors; the installment of array processors in minicomputers will greatly enhance computing capabilities; moreover, their costs will be much lower than large frame machines. In view of actual conditions in China, minicomputers should have a relatively important place in the realm of engineering and scientific computation.

(3) Process Probing and Control Systems

Minicomputers are good at process probing and real time control, and they are extensively used for this purpose in other countries. In China, the relatively slow pace of development in this field is largely related to control targets, measurement and quality analysis instruments. Steps should be taken to energetically popularize computer probing systems and open-loop control systems by developing easy ones first and going on to difficult ones later, and moving from key points to all areas, thus gradually developing both in depth and scope. At present, computers should be extensively used for typical applications in energy and light industrial sectors.

(4) Medical Treatment and Diagnosis Systems

The use of minicomputers for medical treatment and diagnosis is quite popular in foreign countries. This type of application has caught the interest and attention of many organizations and departments in our country, and preliminary results have been achieved. For example, Beijing Computer Plant No 3 and Beijing Chinese Traditional Medicine Hospital jointly developed a "DJS130 multiple terminal medical treatment and diagnosis system based on information from eminent doctors of Chinese traditional medicine." The software package incorporates the rich experiences of two famous doctors of Chinese traditional medicine, i.e., the treatment/diagnosis of hepatitis by Professor Guan Youbo [7070 1635 3134], and the treatment/diagnosis of vascular diseases by Professor Fang Zhixuan [2075 5347 5503]. Some results have been achieved in the clinical application of this system. Besides, desired results have also been achieved by the Shanghai Tumor Hospital and Shanghai Computer Plant in using the DJS131 machine for tumor radio therapy applications, and by the Wuhan Radio Research Institute in using the DJS112 machine for the diagnosis, prevention and cure of cardiovascular diseases. In sum, great efforts should be made in popularizing the preliminary results achieved in the medical application of DJS100 series.

(5) Economic and Office Management Systems

The use of minicomputers in economic and office management systems enable fac-
tories and enterprises to bring about scientific management, fully exploit the
production potentialities of enterprises, conserve energy, cut back material
consumption, and improve work and production efficiency, thus attaining rela-
tively good economic results. This type of minicomputer application should be
energetically developed. There are already some pilot projects underway in
the use of DJS100 series for enterprise management applications, e.g., Huadong
Normal University is currently developing a DJS130 electronics enterprise
management system for Nanjing Radio Factory; Beijing Computer Plant No 3 is
developing a DJS130 enterprise management system for Beijing Television Equip-
ment Factory. To facilitate this kind of development, steps should be taken
to enhance the capabilities of DJS100 series which can be used for this type
of application, such as the COBOL language, and BASIC language designed for
commercial applications. Some concerned organizations and experts are devel-
oping database software for the DJS100 series.

Other applications include communication systems, plotting systems, automatic
typesetting systems, information retrieval systems, picture information pro-
cessing systems, aided designing systems, traffic and communication manage-
ment systems, etc., which should be developed in depth, used on a wider scale,
and popularized.

While setting up application systems, emphasis should be placed on collaboration
among user organizations, manufacturers and research organizations. First, com-
puter equipment manufacturers should collaborate with user organizations. This
is because the former is usually familiar with its own products and not with
the user, while the latter is exactly the other way around. Thus the two
should combine their efforts, make up each other's deficiencies, and thereby
accomplish the computer application part of project. Institutions of higher
education and research organizations should also devote some time and effort
on computer application research work, so as to offset the tendency of focusing
their research efforts solely on the machine development and neglecting applica-
tion; they should make themselves available to the needs of users and manufac-
turers. All three should concert their efforts in opening up the realm of com-
puter applications.

Over the past 10 odd years, the computer enterprise has developed very rapidly
in the United States, Japan and European countries. Moreover, the extent of
computer application has been growing wider and wider with each passing day.
Generally, there are several tens of thousands to several hundreds of thou-
sands of computers in these countries. In our country, there are only some
3,000 computers in current use, and the extent of application is very limited.
Many new application realms await to be opened. China's computer application
has just begun to unfold itself; the task is heavy and the road ahead is long.

Future Goals

The traditional minicomputers are tailored for multiple-job small-scale opera-
tions which require a high degree of reliability at low costs. The speed and
main memory capacity of the processors are not emphasized too much here.

Highly reliable and highly integrated components are generally used for the refined hardware system, and rich software libraries are used for perfecting the system's capabilities.

The continuous improvement and growth of computer technology and application level will gradually reveal the following weaknesses of traditional minicomputers:

(1) Small word capacity (16 bits) restricts logical space of user's program, and affects precision of computation.

(2) Slow speed cannot meet the requirements of large-scale computation problems or high-speed real-time processing; and at the same time also affects the response time of multiple-user timesharing terminal system.

Although the preceding deficiencies can be overcome with large frame machines, it is also possible to overcome them with distributed multi-minicomputer systems and super minicomputers while retaining the original strongpoints of minicomputers at the same time. We believe that the following unique developments will be achieved in the DJS100 series:

1. Distributed minicomputer multi-level system, i.e., multiprocessor systems and multicomputer systems with dispersed capabilities.

(1) Distributed multiprocessor systems include the following types of processors:

Job processor--the host computer of the entire system--runs general processing jobs.

Floating point processor--devoted to high speed floating point computation.

Array processor--specializes in matrix and such high speed computations as Fourier transform, loop filtering, polynomial multiplication and convolution.

Peripheral processor--handles all slow speed word processing equipment and multiple user terminals.

Other specialized processors can be developed, e.g., processors for high level language compilation, etc.

The floating point processor (FPP), array processor (AP) and peripheral processor (IOP) can be linked into a satellite processor/host processor configuration using their own local internal storages while sharing the same internal storage with the host processor. They all have their own special capabilities which are integrated into a single system under the overall scheduling of the operating system. This type of system is cheaper but even more reliable than large frame machines; in certain types of scientific computation and information processing applications, their performance compares favorably with large frame machines.

(2) Distributed multicomputer systems are composed of several or 10-odd mini-computers; the minicomputers are usually of the same type, but different types of minicomputers can be configured into the system as well. Each minicomputer has its own independent operating system to manage its own hardware/software resources for running a certain task. Communication is maintained among the minicomputers while one or two units can be assigned to the task of monitoring and overall scheduling.

In sum, while the minicomputers are dispersed in performing their own special capabilities, they are also coordinated as one system in performing large-scale complicated tasks.

This type of configuration is suitable for large-scale multiparameter, multi-object and multitask control and management systems. In comparison with large frame machines, multiple minicomputer systems configured on the basis of high reliability and low cost have the advantages of easy to maintain, easy to expand, excellent redundancy, and very economical. In foreign countries, there are many examples of the use of such configurations in high energy accelerator control systems, large-scale steel plant control/management systems, etc.

In China, research on parallel multilevel systems designed for high-speed computation is part of the research on large frame machine architecture. But, 3-5 years from now, there will be more and more applications in China using dis-persed multiminicomputer systems.

2. A 32-Bit Super Minicomputer System

In recent years, 32-bit super minicomputers have been pouring into the market and selling like "hot cakes" by competing firms in the United States. It is the inevitable result of the ever-increasing performance/cost ratios of mini-computers and the ever-rising technical level of users. There is bound to be a breakthrough in the traditional minicomputer architecture. Many effective large frame system designing ideas will be introduced into minicomputers, and this kind of trend is sure to produce some kind of influence in China. Digital Equipment's VAX-11/780, Data General's MV/8000 and Prime Company's PRIME 850 machines have arrested our attention. But we should guard against wholesale import of "fashionable" products (though it is necessary to import a small number of machines for reference use). We should build up our strength, step up research, and try to come up with our own super minicomputers within 3-5 years.

As China's DJS100 series minicomputers have fairly sound basis, it is best to develop super minicomputers along the DJS100 line, but with the following characteristics:

1. Retain the strongpoints of traditional minicomputers, i.e., low price, high level of reliability.

2. Develop hardware and software technologies that are compatible to the DJS100 series so that current 16-bit machine users will not be unfamiliar [with 32-bit technologies] when they switch over to the new type of computers.

3. Capabilities should compare favorably with 32-bit large frame series.

As 32-bit machines have greater word capacity and greater logical space, the main memory should generally be the several megabytes, and highly integrated MOS memory should be adopted. Virtual memory and high-speed buffer techniques should be introduced into multilevel storage systems; high-speed logical components, high-speed pipeline, and distributed processing architecture will greatly increase processing speed; peripheral processors and high-speed external channels should be configured into the system to increase information input/output throughput; the response time of timesharing systems supporting several tens of user terminals should be ensured as much as possible.

3. Microminiaturization of DJS100 Series Machines

The emergence of large-scale integrated circuits in our country is bound to lead to the microminiaturization of the DJS100 series. As current DJS100 series machines already have a broad foundation, the microminiaturization of this family of computers plus the compatibility of hardware/software technologies will certainly bring a lot of conveniences to the users. Thus, the microminiaturization of the DJS100 series is a certainty.

The DJS101 model developed and manufactured by the Science Education Instruments Plant of Huadong Normal University is microminiaturized in technological structure using minicomputer units and techniques. The extensive use of this type of computers will open up markets for future microminiaturized DJS100 series machines. At the moment, the most important thing is to have semiconductor plants take up research and development of IC components for 16-bit minicomputers in the DJS100 series, and build a solid foundation.

These are the three goals for future work; we should start research and development along these lines and move on to a new peak.

PROPOSED DEVELOPMENT OF BIT SLICE MICROPROCESSORS

[Article by Wang Jingchun [3769 2529 2504]: "Suggestions on Developing Bit Slice Microprocessors"]

[Text] The introduction of microprocessors in the 1970's touched off a revolution in digital systems. At present, our country attaches great importance to the development, manufacturing and application of monolithic microprocessors. We have been moving forward in this area at high speed, which is quite encouraging. But, it appears that not enough attention is being paid to developing bit slice microprocessors.

Bit slice microprocessors are computer systems composed of LSI bit-slice type microprocessors. Some people do not regard "bit slices" as microprocessors, but rather as parts. Thus, "bit slice microprocessrs" is an abbreviated term for computer systems composed of LSI bit slice parts. My reasons for suggesting developing bit slice microprocessors are as follows:

1. At present, there are quite a few organizations in our country that are developing computers for their own special applications (i.e., 'special purpose computers'). As the result of each organization making its own equipment, computers of all descriptions with no standardization whatsoever have been produced. Moreover, such research and development projects are very costly in terms of time and money. It is very worthwhile to find out how to solve this problem. The development of general-purpose computer series is, of course, our main direction; it is also an inevitable trend in computer development. But based on actual conditions in our country, it is also important to pay attention to developing microprocessors for special needs, e.g., applications which require highly reliable computers with environmental adaptability; computers that can perform high speed real time processing but are not large frame machines at all; computers that can meet special hardware big length requirements, etc. From the standpoint of proper selection of computers, it is not economical to choose general purpose machines which have more functions and capabilities than what is actually needed. From the standpoint of environmental adaptability, it is not easy to find a general purpose machine that can meet the requirements. Conversely, bit slice microcomputers are particularly strong in these two areas. With the use of bit slice cascade connection, it is possible to produce computer word lengths tailored to special requirements;

high speed requirements can be met by the use of low-power Schottky TTL (though ECL circuit can reach higher speeds, they are heavy power consumers; from the standpoint of developing microcomputers and minicomputers, the author suggests that priority should be given to the development of low-power Schottky TTL bit slices). In light of the current technical and technological levels in our country, it is also relatively easier to develop bit slice architecture which can meet strict environmental adaptability requirements.

2. Compared with computers composed of monolithic microprocessors, the chief drawback of bit slice microprocessors lies in the lack of unified instruction sets on macro-instruction level; hence, software development is somewhat limited, which is inconvenient for users. The author holds that this drawback should be approached from the analytical point of view, i.e., the weakpoint of bit slice microprocessors is attributed to its strongpoint--flexibility. We should thus maximize its strongpoint and minimize its weak point by making maximum use of its "special purpose" capability. In China, there are quite a few small organizations which produce computers. They are usually staffed with software and hardware personnel, and are thus in a position to overcome such difficulties. Through the research and development of bit slice microprocessors, it is possible to organize them and gradually move towards standardization. As the chief functional parts of bit slice microprocessors are at least standardized, it is not necessary for each organization to develop its own logic design from scratch. Thus, hardware should be standardized to the greatest possible extent. By loading PROM (or ROM) with suitable contents, it is possible to meet special purpose requirements. In software development, through coordination and mutual help, it is possible to unify and standardize those components which can be unified and standardized, and gradually develop those software which should be developed. This will greatly reduce time and cost needed for research and development, and moreover, help gradually bring about serialization and standardization. In sum, through bit slice development, it is possible to lead these organizations from the path of developing computers "single-handed" to the path of "cooperative transformation." Of course, for those who can use monolithic microprocessors (commonly known as microcomputers), it is not necessary to go into bit slice technology.

INTERCHANGEABLE DISK STORAGE SUCCESSFULLY PRODUCED IN CHINA

[Article: "Interchangeable 6-Drive Disk Storage Successfully Developed in China"]

[Text] In fulfillment of the task assigned by the Shanghai Science and Technology Commission, the Science and Education Instrument Factory of the Huadong Normal University, Gexin Plastic Factory, Huangpu Instrument Plant and Huadong Computing Research Institute jointly developed an interchangeable 6-drive disk storage, and successfully concluded the assembly and debugging phase of the project in June 1980. The disk storage passed a series of test runs which lasted for a fairly long period of time. In December 1980, the Shanghai Science and Technology Commission sponsored a technical evaluation meeting to conduct an all around evaluation of the prototype model which included both technical and economic ratings.

Chief technical specifications of the disk storage are: total capacity 7.25 megabytes; track density 4 tracks/mm; bit density 44 bits/mm; average access time 50 ms.

The prototype disk storage was subjected to 50 hours of continuous operating test without any failure, using the diagnostic and reliability test programs of the DJS100 series disk drive control unit. Besides, a series of performance tests were conducted to check protective function, power source fluctuation, anti-interference, etc. The prototype model worked normally throughout the entire test stage. The evaluation group members unanimously agreed that all the technical specifications had met designed requirements, and the performance of the model was stable and reliable, thus completely qualifying for online work in computer systems. In light of the urgent demand for mainframe support, the evaluation group expressed hope that all aspects of the production and technical preparation work would be carried out to bring about trial production as soon as possible.

Disk storages are indispensable peripherals to modern large-frame computer systems. Compared with magnetic drums and tapes, they have large capacitance with quick access. But China is still lagging way behind in disk technology; it still lacks the capacity to produce this type of equipment and meet the urgent needs of mainframe development. This is due to the fact that this type of production involves high-level precision, high degree of difficulty in

manufacturing, and many kinds of new techniques and technologies as well as basic industrial support which our country does not have yet. We already have the capacity to produce large mainframes with computing capabilities up to 1 million operations per second. But without large capacity disk storage, it is impossible to make the best use of them--they can only be regarded as equivalents of fully configured foreign-made minicomputers. The production and popularization of computers in China have been gravely affected by the current state of backwardness, which, in turn has affected the progress of the "Four Modernizations" program.

The successful development of the interchangeable disk storage indicates that China has achieved remarkable improvements in the development and production of disk storages. For the first time, we have successfully produced disk drives which use magnetic head positioning systems with voice coil linear motor drives. The disk coating technology and read/write performance of disk heads have improved; the recording density has been increased four times; the average access time is nearly 10 times faster than the same type of products produced in this country in the past. As the disk packs are manufactured in accordance with internal standardized ISO-2864 specifications and incorporates DJS100 series general-use interfaces as well, the interchangeability and standardization of the disk storage units have been enhanced, which is immensely helpful to manufacturers and users.

The Shanghai Science and Technology Commission received excellent commendations from the participants at the evaluation meeting for sponsoring the joint disk research and development project. They praised the committee for adhering to the policy of self-reliance especially at a time when importing had become a "vogue" in our country and there was a growing desire to introduce disk production lines from foreign countries. Disk technology is characterized by a high degree of difficulty involving a wide range of disciplines. Based on this characteristic, the committee made good use of Shanghai's superior science and technology resources. In accordance with the principle of large-scale socialist cooperation, it broke down the barriers between various industries by mobilizing and organizing related sectors in the local area to jointly tackle key technical problems involving basic components and special equipment required for manufacturing disk storage units, thus providing the basis for producing such components and equipment independently. The preceding manner in which related scientific research organizations and factories in the city were organized into a concerted disk research and development force constitutes an effective means of speeding up disk technology development.

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DJS051, DJS052AD3 SYSTEMS OUTLINED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 28 Feb 81 pp 1,2

[Article: DJS051 and DJS052AD3 Systems Made in China"]

[Text] The Anhui Provincial Science and Technology Commission and Anhui
Electronics Bureau jointly sponsored a conference in December 1980 to evaluate
the DJS051 and DJS052AD3 microcomputer systems developed by Anhui Electronics
Research Intitute. Some 30 representatives from 16 organizations participated
in the meeting, during which there were technical reports on the DJS051 and
DJS052AD3 systems, and the newly developed prototype DJS040 (Z80); all kinds
of demonstrations were organized at the meeting as well. The evaluation
group conducted various kinds of online tests on the 051 and 052 systems which
proved to be of excellent reliability and accuracy.

Both systems received fairly high commendations from the representatives who
agreed that the models were "successfully designed" and had "use values worth
popularizing."

Made in China

The DJS051 model uses four or five CPU chips jointly produced by Anhui Elec-
tronics Research Institute and Shanghai Radio Plant No 14. Besides the stor-
age units which temporarily rely on imports, the other devices are all pro-
duced in this country. The LSI device of DJS052AD3 are Intel 8080 series
products; its TTL units are basically made in China.

Peripherals include 8-inch floppy disks, 80 x 24 CRT character display units
and audio cassette storage, which are designed and manufactured independently
by the same organization. The systems also support Chinese-made printers
(Beijing Computer Plant No 4 produces 80-column thermal printers; Qianxian
Plant in Nanjing produces 132-column dot matrix printers), photoelectric input
units (Jianghuai Plant in Hefei); hole punchers (Qingdao Miniature-electric
Generator); they are also equipped with EPROM writers.

Software includes mini-operating system MOS, intelligent face board operating
system AKOS, monitor programs CRT edit programs, Assembler language system.
Magnetic disk operating system ADOS and extended BASIC will be available soon.

All of the preceding systems adopt standardized modular designs in accordance with the requirements of the State Computer Industry Administration. The internal bus is S-100, the peripherals use RS-232 serial interfaces, and 8-bit parallel interfaces, so as to accommodate Chinese and foreign-made compatible modular boards and peripherals, which adds convenience to users of various fields. Each modular board in the system has capabilities that are relatively integral and integrated; the users can dismantle any of the modular boards according to his needs, and organize economic and proper applicative systems of suitable scale. The smallest system, DJS-052A, only requires two S-100 modem boards, (each board measures 10" by 5") and the price is very low.

Characteristics of DJS052A

1. Intelligent Face Board IFP--Hardware consists of small 20-key keyboard and 6 light-emitting diode (LED) indicators; software consists of AKOS (ANHUI KEY OPERATING SYSTEM). AKOS has capacity of 3 kilobytes and very powerful capabilities. Besides displaying and loading memories, registers and I/O interfaces separately or serially, it can also exercise simple control over inputs from keyboards, punched tapes, cassette tapes and floppy disks, and output to CRT display units, printers, cassette tapes, paper tapes and floppy disks; it also has EPROM programming ability. Moreover, it can retain user defined commands to enable certain applications to execute process control through IFP instead of I/O equipment or system software, which is very effective for minimizing system cost, simplifying user techniques and popularizing computer application.

2. Mini-operating System MOS--Includes monitoring, editing and assembler; powerful capabilities; easy to use; depends on minimal sources for required hardware components, the smallest system only needs a TTY or CRT; MOS capacity is under 6 kilobytes.

3. CRT display unit--Composed of 12-inch television screen and two S-100 modules. As the display buffer storage and mainframe are linked through a standard S-100 bus and constitute a portion of the main memory, the manufacturing cost of the entire display unit is very low (manufacturing cost basically consists of the two module boards); moreover, the unit is designed for general use and can be easily hooked up to any system with S-100. The display system is synchronous and characterized by excellent resolution and stability.

4. Floppy disk RCP 20-II 8-inch disk; single side; single density; capacity: 3.1 M bits; transmission rate: 250 kilobits/second; access time: 10 mS; average latency: 83 mS. Main technical indexes have reached the same level as products of the same category produced in foreign countries. The evaluation meeting concluded that it was suitable for "small-scale batch production on trial basis."

Characteristics of DJS051

The CPU of DJS051 is produced in China; its clock frequency is one times less than 8080; it outflanks the 8080 inspeed and convenience for application in the following two aspects:

Direct microprogramming control--In certain simple applications, five 051 CPU chips can be used for constructing a minimum system equivalent to a single-chip computer with ROM. Of course, it is also possible to add other components according to requirements for setting up a suitable system.

For applications that require high-speed response, the 051 model can respond in less time sampling units and can therefore offer even greater real-time processing speed.

For 16-bit arithmetic computation and block operation, besides extended micro-programmed 16-bit arithmetic instructions (including multiplication and division) and block operation instructions, the machine also has bit computational hardware which not only doubles the speed of this type of computation over the 8080, but also greatly simplifies the programming of application software.

FEATURES OF 151-3/4 LARGE FRAME COMPUTER SYSTEMS OUTLINED

[Article by Professor Ci Yungui [1964 0061 2710], Changjiang Engineering College: "Features of 151-3/4 Large Frame Computer Systems"]

[Text] 1. General

151-3/4 models are large frame general-purpose computer systems. The 151-3 (developed in 1977) is a monoprocessor system, while 151-4 (developed in 1979) is a dual-processor (or dual computer) system. They are designed for scientific research applications or engineering design computation, and can also be used for real time or nonreal time data processing. The main frequency is 3 MHz. The monoprocessor can execute 1.3 MIPS for 64-bit floating point operation and 2.5 MIPS for 32-bit floating point operation. The dual processor can execute 2.4 MIPS for 64-bit floating point operation, and 4.0 MIPS for 32-bit floating point operation. The machines have four types of instructions, i.e., L, B, D and Z, totaling 166 in all. The main memory is 256-512 kilobytes, which is installed for modulo-4 or modulo-8 cross access. The 153-3 has 64 channels; 153-4 has 128 channels. All kinds of standard interfaces are configured into the machines. They can support a fairly complete range of peripherals. All the units in the systems are made in China.

In order to increase operation speed, ensure high degree of reliability and system flexibility, a series of new technologies are used in the system design, e.g., look-ahead control with variable depth, streamline technology, fairly large instruction buffer-storages, multiple general registers, C registers, ultra-high speed automatic scheduling data buffers, plug-in main memories, error record registers, state registers, proper form-even and check-even layout, modulo-3 checking, modular structure, dynamic backup, automatic switchover into 6 system states and automatic switchover of large units, etc. Based on 1 year of actual runs, the systems have been proven to reach all (or exceeded some) of the predetermined design goals. Moreover, the runs were excellent all the way through, and the systems won high commendations.

2. Features of the System Structure

Duplex parts, modular structures as well as dynamic/static backup and automatic switching techniques are extensively used throughout the systems' overall structures and subsystem structures. The 151-4 is composed of two processor

modules (each includes two identical functional units, one-run control unit, one-instruction control unit, and six advance access registers and two late transmit registers and address code registers); eight main memory modules (8 x 32,000 words x 34 bits); two cache modules (2 x 256 words x 32 bits); two ultra-speed fixed storage modules (2 x 16,000 words x 32 bits) and two converter modules (each includes one information ministorage, one control word ministorage, one controller, scheduler, external interrupt generator and channel status word). These modules can automatically (through supervisor) or semi-automatically change the corresponding "0" or "1" of the system status word in accordance with the user's requirement and the working states of various major units, and thus convert the machine(s) to the following six different working states of the following four types of systems:

(1) Dual Computer System. The main memory works according to dual modulo-4. Processor 0 executes the program in the left modulo-4. Processor 1 executes the program in the right modulo-4. The two programs are completely identical. Two converters (each with 128 channels) are used together, and the channels serve as dynamic backups of each other.

(2) Dual Processor System. The main memory works according to module-8 or modulo-4, while the other modulo-4 serves as dynamic backup or is put under repair. The two converters are jointly used.

(3) Stand-alone Dual Computer System (Dual Monoprocessor System). The main memory works according to dual modulo-4. The two converters are used together. But the 128 channels are divided into two separate groups through program scheduling: The first group (e.g. odd channels) serve the first monoprocessor, and the second group (e.g. even channels) serves the second monoprocessor).

(4) Stand-alone Monoprocessor System (or Monoprocessor Modulo-4 Dynamic Backup System). The main memory works according to modulo-4; the two converters are used jointly. The other processor and the other modulo-4 memory are either dynamic backups or under repair.

The preceding six kinds of working states of four types of computer systems are basically formed from flip-flop states directly controlled by the status words in the control memory, which is simple, economical and easy to realize. Moreover, some of the states are formed spontaneously after removing malfunction units. The entire system is a kind of self-adapting variable structural system which has automatic switchover and automatic organizing capabilities.

9119
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DJS130 MULTI-USER SERVICE SYSTEM

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 12, 20 Jun 81 p 8

[Article: "Remarkable Results Achieved in Kaifeng City's DJS130 Multi-User Service Center"]

[Text] Kaifeng City's DJS130 multi-user service system was recently evaluated by the State Computer Industry Administration and Henan Provincial Science and Technology Committee. The system was developed by Kaifeng Computer Technology Research Institute with the help of Zhengzhou Engineering College and Kaifeng Municipal Bureau of Post and Telecommunications. With the DJS130 machine at its core, the time-sharing system supports remote terminals (ranging from several to 10-odd kilometers away) through the local telephone network, and performs scientific calculations and data processing. The time-sharing system with one host computer and multiple terminals is still in the infancy stage of a computer network, but it can be used under existing local telephone network conditions. The current configuration of the system is shown in the diagram below.

Besides currently-available 100 series software, the system is also configured with extended multi-user BASIC interpreter system, exchangeable BASIC system under RDOS, and a library of application programs.

Performance indexes of the system:

Communication mode:	Full duplex
Synchronous mode:	Synchronous start/stop character
Transmission speed:	$\leqslant 300$ bauds
Characters:	5 units or 8 units
Busy bit error rate:	$\leqslant 10^{-5}$
Number of terminal channels:	12 (expansible to 32)

Since its trial use in 1979, the system has been serving dozens of organizations in the city and other parts of the province, and long-distance telephone terminals have been set up in eight organizations including the Urban Construction Committee, Electric Motor Plant, and Hospital No 3. Excellent results have been achieved so far, and all user organizations are satisfied with the performance of the system. Here are some examples:
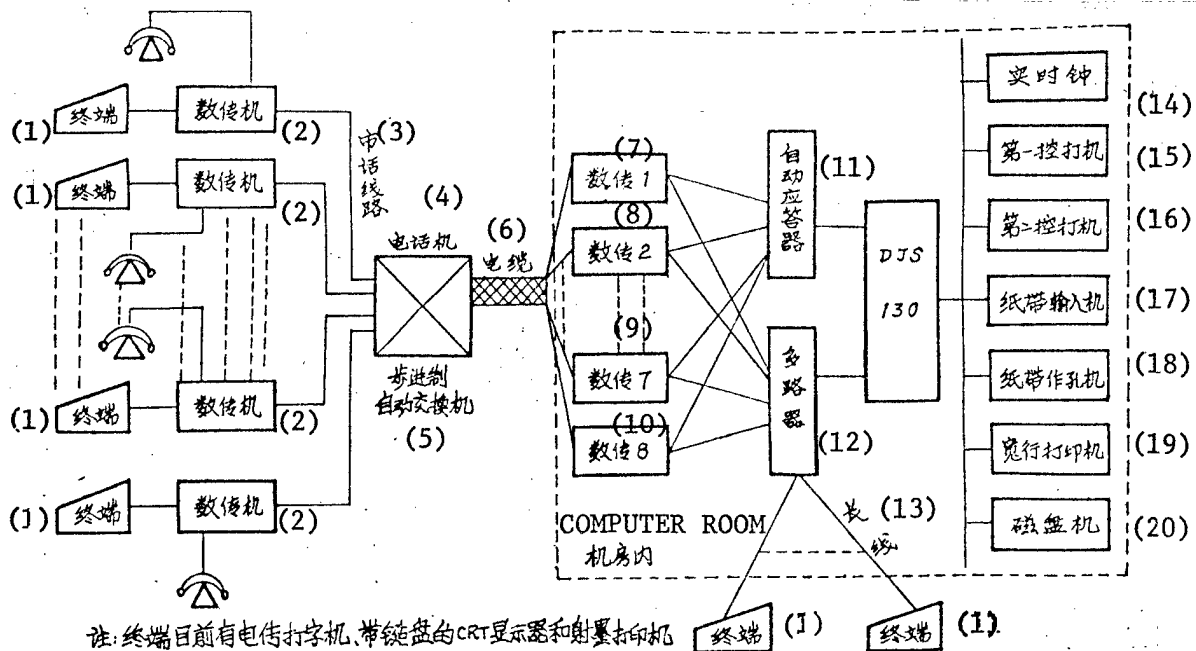
Note: Terminals currently include teletype units, CRT display units with keyboards, and ink jet printers

Key:
1. terminal
2. data set
3. local telephone lines
4. telephone set
5. step-by-step automatic telephone system
6. cables
7. data set No 1
8. data set No 2
9. data set No 7
10. data set No 8
11. automatic answering equipment
12. multiplexer
13. long lines
14. real time clock
15. console typewriter No 1
16. console typewriter No 2
17. punched tape reader
18. paper tape puncher
19. wide column printer
20. magnetic disk drive

1. User: Henan Province Agricultural Region Planning Office

Applications: Process data on agricultural resources throughout the whole province. The 170,000 primary data and 500,000 result data have been entered; 22 target items, such as cultivated area, yield, etc., covering over 2,000 communes, have been compared and sorted.

Result: Fast and reliable statistical computation. Used to lag behind in reporting statistical figures to the State Council; now it ranks among the forefront.

2. User: Kaifeng City College Entrance Examination Board

Application: Statistical computation and sorting of examination scores of 8,000-9,000 examinees.

Results: Finished statistical computation and registration of all college examination scores in only a week's time, completely replacing manual work.

User: Hospital No 3 of Kaifeng City

Application: Introduced hepatitis diagnosis/treatment software based on the experiences of Guan Youbo [7070 1635 3134], a well-known doctor of Chinese traditional medicine.

Result: Remarkable results have been achieved over the past year in the diagnosis and treatment of over 400 cases in the province and city. For example, an 80-year-old female patient had suffered from ascites for 3 years and could not be cured by many doctors. After medical treatment based on the diagnosis performed by the software, the ascites was remedied, and the patient regained her health.

4. User: Kaifeng Urban Construction Committee's Office of Design Work

Application: Civil engineering computation.

Result: In the past, the computation had to be done in Shanghai or other major cities, wasting manpower and money in the process. Today, computation can be performed on the spot; moreover, a fairly large number of optional plans are produced for optimum design.

5. User: Kaifeng Electric Motor Plant

Application: Designing the electromagnetic layout of medium and small size squirrel-cage motors of 40 different specifications.

Results: Manual computation for this type of design work used to be time consuming, which not only delayed conclusion of contract negotiations with prospective customers, but also caused such predicaments as standstills in factory operations, etc. With computer-aided designing, computations based on user requirements can be completed on the same day. Recently, thanks to the speed and accuracy in computation, the motor plant managed to win several hundred thousand yuan worth of customer orders in the competition against 10-odd manufacturers.

DJS100 LOGIC SIMULATOR DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 8, 20 Apr 81 p 7

[Article: "DJS100 Series Logic Simulator"]

[Text] Developed by the Chengdu Telecommunications Engineering Institute
[College], the logic simulator is an application software designed for the
DJS100 computer series, and remarkable results have been achieved by such users
as Institute of Photoelectric Technology under the Chinese Academy of Sciences.

The logic simulator is used for testing logical designs of digital circuits
before the actual circuits are installed; it is also used for evaluating logic
schemes and obtaining detailed information on circuit activity. This is a
concrete example of the application of computer-aided design technology in
logic designing.

This is the first time China has successfully developed a logic simulation
language for minicomputers. Specifications and characteristics are as
follows:

1. A gate level hardware descriptive language (known as "LM-1 language" for
short) is designed to include two major parts: (1) Component statements for
describing basic logic circuits composed of such components as AND gates, OR
gates, NOT gates, NAND gates, NOR gates, AND-OR-NOT gates, exclusive NOR gates
as well as flip-flops and JK flip-flops. (2) Command statements which enable
the simulator to provide certain functions with the necessary action parameters.
The syntax of the statements is simple, easy to understand, easy to read, easy
to write, and suitable for popularization.

2. Simulation System: Characterized by use of tabular input format when
entering source statements for building internal models. The system is also
equipped with a waveform generator statement which creates a group of 3-valued
input waveforms to activate 3-valued signal transmission inside the circuit,
thus causing the component processing subroutine to operate on 3-valued truth
tables.

3. Test Result Output System: The simulation results are output in the form
waveform graphs on teleprinters or line printers, and the actions of 20 com-
ponents can be observed at the same time. The output waveforms are clear and
direct, and easy to analyze.

9119
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PORTABLE DIGITAL LOGIC EXPERIMENT EQUIPMENT DEVELOPED AT NANJING UNIVERSITY

[Article by Lin Xinyuan [2651 0207 0337]: "Nanjing University's Computer Science Department Successfully Develops New Type of Digital Logic Experiment Equipment"]

[Text] Circuit and logic experimentation constitutes an extremely important part in computer science education. It is not only a means of teaching students about circuits and logic, but an important means of enabling students to acquire a certain amount of skill for conducting experiments as well as ability to perform practical work, which helps to prepare the students for work after graduating from school in the future. Thus, circuit and logic experimentation is also an important means for teaching students how to combine theory with practice. However, our circuit and logic experiment equipment was still at the level of the 1960's. Moreover, our experimentation skills were backward, and we achieved very little results at high costs. Faced with the rapid growth of the computer enterprise, the broad ranks of faculty and staff in our department resolved to change the face of the laboratory. To achieve this, we did a great deal of reading, visited several universities in the country to exchange experiences on the teaching of experimentation courses, and conducted a fairly extensive investigation and study as well. The problem was discussed at the Symposium on Experimentation Work in Computer Education convened at the request of the 1979 National Computer Annual Conference. The participants at the symposium agreed on the urgency of developing general purpose experimentation equipment adaptable to LSI, MSI and SSI. Our department's digital logic laboratory workers undertook the task of developing a new type of digital logic experiment equipment. With the cooperation of some factories, it took them over half a year's effort to come up with trial-produced SJB-46 experiment breadboards and DLB-1 logic experiment boxes.

The SJB-46 breadboard (currently batch produced by Jiangsu's Wujin Xian Radio Components Plant) is an expansible multisocket board with 46 lines. This type of board is very popular in foreign countries and easy to process. It has 23 rows of socket holes on either side; each row has 5 interlinked socket holes. The distances between the holes are designed according to distances between external lead wires of standard dual-in-line IC packages, thus making it possible to accommodate all kinds of SSI, MSI and SSI in standard dual-in-line packages, as well as other kinds of electronic components and conductors with 0.5 mm leads. The chief specifications of this type of breadboard have

reached the same level as foreign made products of the same category. The DBC-1 experiment box is manufactured by the Xu City Electronic Equipment Plant in Jiangsu Province's Changshu County. The box is equipped with 12 SJB-46 experiment breadboards, 5 Volt (1A)/10 Volt (0.1A) dual voltage DC voltage-stabilized power supply, countable logic pen and low-frequency pulse injection pen, 8 LED indicators with drives, 2 seven-segment displays with decimal decoders, 8 logic switches and 1 single-pulse button switch. The experiment box is not only designed for digital circuit and logic design experiments, it can also be used for conducting experiments on simple microprocessor systems as well as expanded experiments on single-board microcomputers. The box also comes equipped with simple tools and spare circuit boards, and can be conveniently used for performing experiments any time any place. Thus, it is also referred to as "portable lab." In other countries, quite a few univerisites and colleges furnish their students with similar equipment for this kind of experimentation course, and the equipment is well received by students and instructors. Our Computer Science Department has already begun to use this type of experiment equipment in digital and logic designing experimentation classes. Practical results indicate that SJB-46 experiment breadboards and DLB-1 digital logic experiment boxes have the following advantages in the teaching of experimentation courses:

1. Less waste: In the past, IC components had to be soldered onto printed circuit boards for each experiment. The parts and printed circuit boards become useless after the experiment, and new parts have to be purchased for the next experiment. Now, it is possible to use the integrated circuits and parts over and over again, which greatly reduces experiment costs.

2. Save time: In the past, students had to assemble circuits with soldering irons in order to perform such experiments. As mistakes or poor soldering often happen, it was necessary to check the circuits numerous times before they could be used for the experiments. Now, there is no need for soldering as the IC circuits and components can be inserted into the breadboards. Moreover, even if mistakes occur in line connections, they can be corrected quite easily. This way, it is possible to save one-half or two-thirds of the time needed for conducting such experiments.

3. Wide use: The logic experiment box is not only useful for experimenting with all kinds of logic circuits, it can also be used for fairly large-scale combination experiments and microprocessor experiments, which are conducive to the development of scientific experimentation.

4. Convenient: The experiment box is compact and equipped with voltage-stabilized power supply and such functional testing devices as logic pen and pulse pen, as well as functional tools and integrated circuits. It can be used in any place that has AC power lines.

Over the past half year, besides digital logic experimentation courses, the faculty and students of Nanjing University's Computer Science Department have also successfully performed the following medium-scale experiments with this type of equipment: making Chinese character keyboards, dynamic memory devices (MOS RAM), D/A converters. With this type of experiment box, they have combined education with scientific research, thus giving impetus to the development of education and scientific research.

SJB-46 experiment breadboards and DLB-1 digital logic experiment boxes are used all over the country in many provincial and city institutions of higher education, scientific research organizations and concerned factories, mines and enterprises, which goes to show that they are not only suitable for experimentation courses in the educational field, but also for circuit building and experimentation in scientific research. We are confident that they will contribute to the modernization of circuit experimentation.

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PHOTOELECTRIC TAPE READERS TYPES, FEATURES REVIEWED

[Article by Wen Jianchun [3306 1696 2504], Yantai Radio Plant No 2: "How To Properly Select Photoelectric Tape Readers"]

[Text] Computer users are all quite familiar with photoelectric tape readers as every computer system is configured with one--they are inseparable as body and shadow. But some users may not necessarily know anything about the various types and features of this kind of equipment. We often come across such strange and lopsided situations as a huge photoelectric reader hooked onto a small minicomputer. There are also small photoelectric readers placed next to large frame computers, like a tiny horse pulling a giant cart. These examples show that quite a few users lack adequate understanding of the types and features of photoelectric readers, and their choices are consequently inappropriate and irrational, thus causing a lot of problems in operational use.

To properly choose photoelectric readers, one must first of all get a basic understanding of this type of equipment.

Photoelectric readers are roughly divided into three types according to size: large, medium and small. Generally, they are classified according to the following three aspects: (1) external size; (2) number of functions; (3) read tape speed. Large photoelectric readers generally come in large sizes with fairly complete capabilities, fast reading speed of approximately over 900-hole columns per second; some are equipped with two interchangeable tape transport-read units; some are equipped with manual interrupt, tape break, tape end, ready, and other interfaces, as well as adjustable light emission circuit. RDG-8, RDG-9 and RDG-16 fall in this category of photoelectric read-ers. Small photoelectric readers are generally relatively small in size, equipped with one kind of function, and low price; but their reading speed is relatively slow--less than 200 hole-columns per second, such as the RDG-10 model. Medium frame photoelectric readers fall between large and small machines; they come in moderate sizes with several simple functions; the reading speed is generally approximately 200-hole columns per second. RDG-5, RDG-6 and RDG-7 models fall in this line of photoelectric equipment.

In most large frame models, the paper tape is transported by means of a drive wheel motor in conjunction with a tape advance wheel; the tape take-up and

release spools are stopped by the combined action of the motor brake and magnet-driven belt. In most medium and small size photoelectric readers, the paper tape is transported by means of a drive wheel motor in conjunction with a tape advance wheel, and the tape is stopped by a pressure block controlled by an electromagnet; some models control the tape start/stop mechanism by means of a step motor in conjunction with sprocket holes in the gear wheel. The step motor is controlled by circuit which constitutes the start/stop mechanism of the paper tape transport system.

Besides, there are two kinds of start/stop transportation mechanisms: slow start/stop and fast start/stop. Most early models do not have the fast start/stop feature. For reading program tapes, there are inertia gaps for the spools on both ends of the paper tapes; in some program tapes, gaps are also planted in places along the tape for the machine to stop. These types of machines are slow start/stop models. In recent years, some computer systems require enhanced overall performance which calls for fast start/stop photoelectric readers; i.e., each time the computer sends out a start command for advancing one hole column, the photoelectric unit reads in one hole column of information, and the brake distance is less than 1 mm. In other words, each time the computer sends out a stop command, the photoelectric reader has to overcome the inertia of the tape spool so that the tape stops between the finished column and front border of the next column, thus ensuring the next start-and-read session without missing any of the holes in the process. This way, there is no need for inertia gaps in the program tapes. When real-time DOS programs came into use, computers set even higher requirements on the fast start/stop performance of photoelectric readers which had to be equipped with random reset function as well.

Thus, the proper selection and use of photoelectric readers should be based on the requirements of a particular computer model. This enables users to make rational purchasing decisions on suitable kinds of equipment and good use of available resources.

Following are some examples:

(1) If the tape programs are lengthy and entail large volumes of input but with no fast start/stop requirements, it is advisable to consider such large-frame slow start/stop models as RDG-8 and RDG-9. The characteristics of RDG-8 lie in the absence of photoelectric amplifier and other interfaces, which are suitable for computers equipped with photoelectric amplifying units and do not have special interface requirements. RDG-9 models are equipped with manual interrupt signal, tape break signal, tape and signal and ready signal interface lines; its photoelectric amplifying unit is adjustable; it is well equipped with electrical equipment and functions, and it can transmit standard signals directly into computers. It is the high-speed version of RDG-8.

(2) If the tape programs are lengthy and entail large input volumes with fast start/stop requirements, the RDG-16 photoelectric reader is a good choice. Besides all the electrical performances of the RDG-9 model, the RDG-16 photoelectric reader comes with fast start/stop functions and photoelectric current/voltage indicators; it is fully equipped with various functions and

capabilities, and is easy to operate. The preceding three types of photoelectric readers are mostly used to support large and medium computers.

(3) If the tape programs are of medium input volume and require fast start/ stop functions, RDG-5, 6 or 7 models would be excellent choices for medium and small frame computers. The RDG-5 is characterized by simple circuits, more mechanical units, and maintenance and adjustments are required for the mechanical parts when the machine is used over a long period of time. But the price is low. RDG-7 and 7 models have more circuits, simple mechanical units, and generally require no adjustments or servicing when used over a long period of time. But the prices are higher than model 5.

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SOFTWARE INDUSTRY DEVELOPMENT LOOKED AT

[Article by Li Weiyi [2621 4850 4135], Taizhou Electronics Research Institute, Jiangsu Province: "The Key To Developing Software Industry Lies in Tapping Potential Resources"]

[Text] After reading the article "Software Industry Should Take the Lead" in issue No 3, 1980, I pondered over the author's words "Let software take the key role; let software lead hardware; let software serve hardware." This is really a brilliant idea which conforms not only to the actual conditions in our country, i.e., large population, backward economy, and the immense difficulty of popularizing computers within a short period of time, but also to the current economic adjustment guidelines, i.e., reduce number of projects which draw heavily on capital resources, and increase the number of projects which rely heavily on manpower resources.

Then how to develop our software industry? Although we should definitely vigorously train and foster a new force, in my opinion, the key to software industry lies in tapping potential forces. On the basis of fully and properly exploiting the current software resources, we should gradually expand the contingent and set up all kinds of software factories (including neighborhood-run factories).

Although the software development force in our country is still quite weak, it has nonetheless initially grown to a considerable size. The main problem now is that it has not been properly or effectively organized. The software production is still in a state of scattered "small-scale peasant farming." Redundant work and nonstandardized products can be found everywhere. Specialized production is even worse; no matter how big or small a system is, almost everyone has to share full responsibility, i.e., from overall designing to flowcharting, programming and debugging; senior software specialists and engineers are also involved in programming. The use of such resources is extremely irrational. The distribution of work is likewise irrational. Large projects are mostly assigned to large and well-known organizations, while small and unknown organizations stand no chance at all irrespective of how resourceful they may be. As a result, some organizations are overladen with work while others have practically nothing to do at all. Consequently, large organizations often delay projects due to overburdening tasks, while software people in smaller

organizations are either forced to idle away time or change professions alto-
gether. It is said that there are quite a few software people who are under-
worked, which means there is still quite a large potential force to be tapped.
In foreign countries, programmers are most urgently needed whereas some of our
software people with over 10 years of working experience have not had any
projects to work on for a long time. There is no way of getting assignments,
and there is no way of getting transferred to places where work is available--
can we allow this situation to continue?

The waste of human resources is the greatest waste of all. I believe that
earnest, proper and effective efforts should be made to organize the currently
available software people in our country as soon as possible, establish a
centralized business assignment system, and greatly promote specialization,
standardization and unification in production. The scattered software resources
should be relatively concentrated. Is it possible to set up regional software
centers in the northeastern, northern, western, southwestern, eastern and
southern parts of China, and have each software center set up all kinds of
software factories, and software service firms which will provide software to
both China and foreign countries? If so, the productivity of software busi-
ness is bound to double and redouble, and the technical level will also improve
rapidly.

On the basis of the results achieved in tapping potential resources, and in
accordance with actual needs, we should gradually broaden the contingent of
software workers and build a mighty force which will help change the backward
state of our country's software industry.

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DIGITAL IMAGE CRT SUCCESSFULLY DEVELOPED

[Article: "Digital Image Display Terminal Successfully Developed"]

[Text] The Image Processing Group of Qinghua University's Radio Department completed their research project on "Type-I Digital Image Display Terminal" in a little over 2 years' time. The performance specifications of the machine has reached national advanced level, and are comparable to foreign-made 1978 models of the same category.

The Type-I Digital Display Terminal is characterized by the following four main functions: (1) memory capacity: can store 256 x 256 x 11 bits of picture information; (2) window real-time processing capability: can retrieve and display any gray-shade portion from the image's 2048 tonal grades, which is a highly efficient means of image enhancement and feature retrieval; (3) false coloring real-time processing capability: use of different colors to represent various gray shades, thus converting a gray-tonal image into a (false) color image, the purpose of which is to enhance image display results; (4) image-and-character superimposed display capability: for captions, the keyboard can be used to type in characters anywhere in the picture.

The Type-I Digital Display Terminal can be configured into DJS130 or DJS140 systems to form interactive image processing setups. It has interface circuits for the DJS100 series; the image refreshing memory is 4 K RAM; and it is equipped with 20-inch color monitor and 12-inch black-and-white display unit. The R&D group is currently developing a Type-II Image Computer Display Terminal with enhanced processing capabilities.

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COMPUTER APPLICATION IN MACHINERY PROCESSING INDUSTRY

[Article: "A Concrete Example of Computer Application in Machinery Processing Industry"]

[Text] This article introduces a method for computing the adjustment cards of spiral bevel gear machine tools.

The spiral bevel gear machine tool is an automatic lathe. Prior to the cutting of spiral bevel gears, the worker has to make appropriate adjustments on the machine tool according to the data on the lathe adjustment card. The card data is usually computed manually, spending as much as 6-7 hours, and frequently with errors, thus affecting the quality of the spiral bevel gears.

In other countries, the Gleason spiral bevel gear machine tool produced by an American firm uses computers to complete the adjustment card data. The meshing spots processed according to the computer-punched cards are fairly ideal.

The Computer Application Division of the Shanghai Machine Tool Research Institute believes that one of the most urgent problems which needs to be solved now is the replacement of manual computation with computers in order to liberate technicians from tedious computation work and eliminate human error in calculation. A computer program has now been developed in BASIC language for this purpose.

The software is based on Ketrinsky's rules of adjustment computation. Instead of looking up tables, the polynomial adaptive optimization method is used for obtaining and processing height deflection coefficients and tangential deflection coefficients. Likewise, other types of data are obtained through continuous logic decision processing on the computer. As manual table checking has been replaced by the computer, it is possible to produce all the card data instantaneously by merely entering 10-odd items of primary data into the computer through teletypewriters.

The computer program is suitable for the following five types of domestically produced machine tools: Y2212, Y2225, Y2235, Y2250 and Y2280. With the aid of computer-punched data cards, satisfactory results have been achieved in machine tool processing.

The application of computers in production and providing computer service to the machine processing trade should not be overlooked in the drive to popularize computers.

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COMPUTER USE IN DESIGNING, MACHINING

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 28 Feb 81 p 8

[Article by Zhang Shaohua [4545 1421 5478], Computing Technology Research
Institute, Zhejiang Province Science and Technology Commission: "Computer
Aided Designing Used in Cam Designing, Plotting and Machining"]

[Text] Cams are indispensable control parts used in automation by all
branches of industry. From sewing machines and wristwatches used in daily
life to mechanical hands and robots in industrial automation, cams constitute
a vital part for controlling all kinds of actions and movements. Although
cams appear to be small and bumpy parts, they are not so easy to design at
all. It is extremely difficult to design a high precision cam which meets
all kinds of requirements. Designing cams by applying the "analytical method"
or "graphic method" according to mechanical principles is not only time
consuming--often taking up many weeks, but also impossible to meet the design-
ing requirements or precision. This problem has never been properly solved as
it involves complex mathematical models, complicated and tedious computations.
The blueprints, moreover, are difficult to draw, and it is naturally even
more difficult to machine them with any degree of precision.

Computers Can Solve the Difficult Problem

We have explored ways of using computer-aided methods for designing, plotting
and machining this difficult but useful machinery part. Furthermore, we have
succeeded in achieving a higher degree of automation in cam designing with the
help of computers. In collaboration with Associate Professor Xu Zhenhua
[1776 2182 5478] of Zhejiang University's Department of Mechanical Engineering
on a joint project to develop an "oil motor stator curve modeling cam" for
Zhejiang University's Dongfanghong Machinery Factory, we plotted cam contour
diagrams with the help of computer-aided designing technique, and punched
program paper tapes for numerical control machine tools. Both the dimensions
and precision of the products were in complete agreement with the specific
requirements, and the technique is now employed in actual production. This
completely justifies the feasibility of the use of computer-aided techniques
for designing, plotting and machining cams. We also compared noncomputer-
aided designing against computer-aided designing. Without the computer, cal-
culation and plotting alone (not including machining) took up 2 weeks, and
the degree of precision was not satisfactory at all. Now, with the aid of

computers, it takes only 3 minutes to complete the designing, computation, plotting and machining data for the numerical control lathe, and the degree of precision has been greatly improved. Besides the preceding project, we also conducted simulating the designing and plotting of various typical kinds of cams, and the results were all quite satisfactory too. With computers, it is also possible to modify unsatisfactory portions of the design any number of times until all of the user's requirements are met.

Analyzing, Classifying and Developing Software

There are many different kinds of cams. According to the contact elements between moving members and cams, the latter can be classified into sharp top, roller and flat base types. According to the movements of moving members, cams can be classified into shift and rocker types. According to the relative installed positions between the moving members and cams, the latter can be classified into centering and eccentric types. Based on the types of mechanism alone, one can find several tens of different kinds of cams. If computations and designing are conducted directly on the computer without mathematical processing, one would not only waste a great deal of computer time, but also end up with useless results. Thus, we have reclassified the preceding several tens of types of cams into the following four broad types based on mechanism:

(1) cams of roller/shift driven members
(2) cams of flat base/shift driven members
(3) cams of roller/rocker driven members
(4) cams of flat base/rocker driven members

Based on dynamics, we have also produced a universal parametric expression for the preceding four types of cams using the envelope method in differential geometry as well as direct geometric methods.

Based on the parametric equations, we drafted charts directly using the stratified drafting method with implicit parameters of derived functions. In the course of drafting, the user can instantaneously find out if the cam design satisfies the designer's requirements or whether there are any problems in the designer's blueprint. It is also possible to modify the base radius and various parameters through the console keyboard or photoelectric reader; the modifications can be performed repeatedly on the computer until the user is satisfied. If the computer is configured with a visual display unit, modifications can be done on the screen with a light pen. When the designer is satisfied with the results, the computer can output the data of all the coordinates for him. If there is need for direct online to the wire cutting numerical control lathe, all that has to be done is to turn the preceding designing, computing and cam drafting software into a subroutine which can be called from the wire cutting program, and the output punched tape can be immediately applied to the wire cutting lathe without going through other processing. The radii of various kinds of machined molybdenum wires used in the wire cutting lathe are all included in the design, thus ensuring the precision of the machined cams.

In the original software, the movement pattern equation for designing a given cam had to be supplied by the user, which was very inconvenient to the user; sometimes, the user is confronted with problems which cannot be solved at all. To solve this contradiction, we improved the software. A series of frequently used movement pattern equations have been developed, e.g., linear motion, uniform acceleration, uniform deceleration, cubic curve motion, sinusoidal acceleration, cosinusoidal acceleration, trapezoidal acceleration, etc. Also incorporated into the software are ways of ensuring the smoothness of nodes under all kinds of circumstances.

Now it is quite convenient for users to come up with cams according to his own specifications. He no longer has to supply the cam designer with various movement pattern equations. All he has to do is to describe the movement patterns of each section, e.g., linear motion in the first section, parabolic motion in the second section, etc. The rest is all taken care of by the computer which selects the appropriate movement equation and cam type, and computes and drafts the charts according to the user's description of the movement pattern. This greatly reduces the designer's workload, and liberates him from complex computation, designing and plotting work, thus greatly improving the speed and precision of designing as well as the degree of automation. After computation, designing, plotting, repeated modifications until satisfactory results are achieved; the computer prints out the data of all the coordinate points and plots the standard blueprint of the cam. If online production of the cam is required, a high speed tape puncher is used to punch tapes for the numerical control lathe, thus materializing online machining.

The computer-aided cam designing, plotting and machining methods described above are only attempts and practices which have to be further studied and improved in the future.

9119
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COMPUTER USE IN SHIPBUILDING INDUSTRY REVIEWED

[Article by Yuan Cunxian [0337 1317 6343] and Fan Jiebei [5400 4105 0271] of Shanghai Shipbuilding Technology Research Institute: "Fifteen Pears of Computer Application in Shipbuilding Industry"]

[Text] I. Introduction

In the early 1960's, with the rapid growth of computer technology, shipbuilding scholars and experts around the world became energetically involved in research on applying computer technology in shipbuilding. They have achieved remarkable economic results, and helped to accelerate the development of shipbuilding industry.

Under the influence of worldwide shipbuilding science and technology, we also became involved in this type of research in 1965, and have achieved fruitful results.

II. Main Work

In the past 15 years, we conducted extensive research on the application of computers in shipbuilding, striding forward towards the world's advanced level. The entire research project is broadly divided into the following three major stages.

(1). Exploratory research stage (1965-1969)

In the early 1960's, when we learned about the efforts of several advanced shipbuilding nations that were probing into the application of computer technology in shipbuilding and the breakthrough in fair mathematical ship lines, we immediately started joint research with fraternal units on mathematical ship line fairness and plank mathematics. Thanks to the initial success achieved in an experimental fishing vessel project of Jiangnan Shipyard, we came to understand that computer application in shipbuilding was an important direction for future growth in shipbuilding technology.

To speed up research work, in 1969, we purchased the first X-2 computer for the shipbuilding system, and the computer went into operational mode in 1970. It turned out to be immensely helpful for the initial stage of the research work.

2. "System" Program Module Research Stage (1970-1976)

In the early 1970's, computer application in shipbuilding entered a new stage when all kinds of shipbuilding integrated circuit systems (abbreviated to "system") emerged one after another, which helped to strengthen our confidence in research. We studied and went abroad to survey the major contents of advanced "systems" of the world. With special emphasis on lofting, setting plank seams (?), and plank development, we tackled key problems and achieved one breakthrough after another.

Due to the in-depth development of our research, in 1974, we replaced the original computer model with a Chinese-made DJS-8 medium frame computer which has a memory capacity of 64 kilobytes x 48 bits, average speed of approximately 240,000 operations per second, and simple I/O management. We also imported a large frame numerical controlled plotter, the technological level of which was that of the 1970's. These sets of equipment further accelerated our research work.

In 1974, with the support of concerned departments, we organized a research project on large-frame numerical controlled plotters. In 1975, a model was successfully developed, thus filling in a gap in China's shipbuilding and electronic industries. It is now mass produced by Shanghai Automation Instruments Plant No 2.

The importation and development of plotters have contributed to the development of our nation's software as well as plotting techniques.

Together with Zhejiang University, we were awarded at a science conference for attaining international level in our research on deflection lines and dual arc fitting. Another project which nearly reached international level was the DJS-8 ALGOL language developed in collaboration with a computer research institute.

Subsequently, in coordination with Zhejiang University, we developed the "one tape/multiple machine" and "multiple tape/one machine" methods and software which allow punched tapes of different kinds of machine coding to be interchangeable. This achievement has received excellent commendations from specialists in our country.

3. "System" Research Stage (1977-1979)

The prerequisites to our "system" research were:

(1) Installation of a DJS-8 medium frame computer configured with two drums and two magnetic tape drives which provided preliminary basis for developing a data base;

(2) Development of application program modules;

(3) Employment of hardware maintenance and software research specialists.

Drawing on experiences from other countries, we made overall plans. As we recognized the difficulties in developing a comprehensive shipbuilding system (SBS), a plan was formulated to develop a simple but feasible hull construction system (HCS). It took us over 1 year's effort before the HCS system was finally developed; it was the first "system" of its kind in our country which had reached international level. The entire "system" has 350,000 instructions; centered around a database, it runs under an operating system especially designed for shipbuilding.

Besides, we also have successfully developed other software systems, such as: ship designing integrated programs system (SDS), ship pipe integrated programs system (PCPS), graphic processing language (HCL), which also received excellent commendations at domestic and international technical exchange seminars.

To meet "system" requirements, we have exerted tremendous efforts in developing and improving hardware. We have solved the tape drive unstability problem, realized the online use of DJS-8 computer and the SM-4 plotter, developed dual processor communication software, and conducted experiments on using the DJS-8 computer for transmitting data via city power lines, thus laying the foundations for building a computer network.

III. Looking Ahead

The 1980's is an important decade for materializing the four modernizations. We are prepared to do the following three things: (1) On the basis of the HCS system, develop a large-scale SBS system incorporating our own special features; (2) purchase new computing equipment, set up a shipbuilding computing center, and develop software for shipbuilding; (3) energetically serve the exportation of ship products, shipbuilding technology and "system" technology.

We firmly believe that on the basis of the preceding three items, our technology will be elevated to an even higher level and make greater contributions to the shipbuilding industry.

9119
CSO: 4008/98

W91-III MINICOMPUTER PRODUCED FOR SHIPBORNE APPLICATIONS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 7, 5 Apr 81 p 1

[Article: "W91-III Shipborne Minicomputers Commercially Produced"]

[Text] W91-III machines are shipborne general-use minicomputers designed in China.

Based on its performance at the National Major Projects Test, the model has demonstrated such characteristics as stable and reliable performance, easy to operate and maintain, good environmental adaptability, excellent protective capabilities against humidity, salt corrosion, shock and vibration. It is a fairly good model for applications on ships and motor vehicles.

W91-III characteristics: 16-bit word length; fixed point, binary, complimentary and parallel operations; flexible modular structure tailored to the needs of various users with different scale requirements; adaptable to any type of peripherals with appropriate interface; suitable for scientific computations, experiments, real time control and testing; can be used as terminal of large frame computers.

The minicomputer has 2 MHz clock frequency; the work cycle of its 16-bit adder is 500 nanoseconds; its comprehensive computing speed is 200,000 operations per second. Besides instruction counters, it has four general-use registers which are also used as index registers. The model is equipped with 65 instructions, 3 interrupt levels and a duplex channel common bus structure.

Its magnetic core memory uses the 3-D 3-wiring coincident-current selection system. The read/write cycle is 1.6 microseconds. Including the check bit, the total word length measures 17 bits; the basic memory size is 16 K, and can be expanded to 64 K.

The interface's index registers have 4,096 addresses, which is quite adequate for the extensive needs of real time control and data processing.

Besides, the computer is also equipped with high-speed data channels and basic peripherals. For the convenience of users, it is configured with standard interface logic.

At present, the system is configured with the following software: supervisor, standard subroutines (for single-length, double-length, and triple-length primary functions), single-user BASIC, FORTRAN, Assembler, counter-assembler, and maintenance program.

In 1980, this model was used for the National Major Projects Test; it was awarded by a government department for its reliable performance in completing the task.

The model has already been approved for production.

9119
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SUBWAY CENTRALIZED DISPATCHING COMPUTER DEVELOPED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 13, 7 Jul 81 p 12

[Article: "Centralized Dispatch Equipment Successfully Developed in Second Stage of Beijing Subway Project"]

[Text] The capital city's circular underground railway is now basically completed, and will be tied into the east-west subway line to form a network. To ensure the traffic safety of future subway trains, enhance transportation efficiency and reduce labor intensity, the Nanjing Wired Communications Plant has developed a centralized dispatch control system.

Controlled by a computer, the equipment can implement centralized dispatches and information displays with its remote control and telecommunication functions. It is chiefly composed of a console, data transmission unit, and logic unit which can be controlled either manually or by computer. When controlled by computer, the computer produces control command digital signals based on preprogrammed train dispatch programs; the signals are converted into audio-frequency continuous signals through a digital/analog converter; the latter is transmitted through the bottom cable to all subway stations which are linked to four bottom lines in parallel. On receiving the signals, the data transmission equipment of the stations converts them back into digital signals which are relayed to the logic units for processing; corresponding execution signals are generated and used for ordering corresponding relays into action through the centralized electric units which control the stations. The train-movement signals from the centralized electric units are then gathered by the stations into their logic devices for sampling and coding, and subsequently sent to the stations' data units to be converted into audio frequency contin-uous signals which are transmitted via the top cable back to the central sta-tion. The signals from the various stations are picked up by the central station's data transmission equipment, converted into digital signals, and sent to the logic device of the central station for processing. Subsequently, the processing results are transmitted to the computer and displayed on the display board.

The system uses a survey scanning method to gather all kinds of information regarding the control area of each station, i.e., it polls the stations one after another over and over again in a certain periodic cycle, and scans the entire area of each station. The repeated scanning of each bit of information greatly enhances the credibility of the information on the display board.

The equipment allows a dispatch center to cover 25 stations within the range of 40 kilometers; the stations are approximately 1.5 kilometers apart from each other. The system works on either one-way control or two-way control from the dispatch center.

One outstanding feature of the equipment lies in the use of 1,200 bytes/second phase modulated data transmission technique in remote control and telecommunications systems, and the transformation of the 1:1 operation mode to a 1:n parallel synchronization mode which is suitable for railway operations and can cut down the number of cable channels and voice lines. Besides, the extensions are connected to the central dispatch in parallel, which allows the entire system to function normally even in the event of a breakdown in one of the stations.

The equipment has already been evaluated by the automation departments, and will begin to serve Beijing's subway system not long from now.

9119
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DJS24 USED FOR WEATHER FORECASTING

[Article by Pan Liangyuan [3382 5328 0337] of Yancheng Regional Planning
Commission: "Preliminary Results Achieved in Computerized Weather Forecasting
in Our Region"]

[Text] Weather changes are the combined results of many different kinds of
factors. Some of the factors can be directly measured with meteorological
instruments, such as air pressure, temperature, humidity, wind direction, wind
speed, etc.; some factors have to be obtained through complex computation,
e.g., the magnitude of atmospheric convergence, divergence and ascending speed,
as well as the rotational motion of the atmosphere. These physical quantities
are used to describe the motion of the atmosphere and are important objective
bases for analyzing the weather. In the past, the improvement of forecasting
accuracy had been affected to a certain extent by the limitations of computing
tools which could not be used at all for any kind of application.

In coordination with Yancheng Prefecture Meteorological Observatory, the Com-
puter Center of Yancheng Prefecture tried to improve the daily forecasting of
the plum rain season in 1980; they computed the divergence, vorticity, vortex
advection and vertical speed of three atmospheric layers at 850 millibars,
700 millibars and 500 millibars, covering approximately 2.9 million square
kilometers at 2.6°N-40°N, 106°E-123°E. They used the finite-difference equa-
tion to describe the motions of the atmosphere. An experienced technician
would take approximately 8 hours to manually compute the four items (i.e.,
divergence, vorticity, vortex advection and vertical speed) and 12 quanti-
ties of three layers with no guarantee as to the accuracy of the data. As
the time factor is very essential tin weather forecasting, with manual com-
putation, it is impossible to come up with the results in time for weather
forecast announcements. In the summer of 1980, we used a DJS-24 computer to
compute the day by day physical quantities in June-July 1975 and 1976, and the
physical quantities of rainstorm days in June-July of 1976, 1977 and 1978.
Besides, we also computed 54 sampling data obtained from 13 typhoons. It was
on this basis that the preceding computation of four times and 12 quantities
of three layers was performed daily at 0800 from 5 June to 21 July 1980.
After entering the values at u, v points into the computer, it took only 11
minutes for the machine to print out the accurate results, thus improving the
efficiency by more than 40 times. High-speed computation with computers not
only provides the daily forecasting work with objective and reliable data,

but also serves meteorological broadcasts and supplies the meteorological observatories of our province and Shandong, Anhui and Zhejiang with analytical reports.

In 1980, eight rainstorms hit the Yancheng Prefecture during the plu rain season. With the help of the computer which produced reports on physical quantities data that clearly reflected the approaching rainstorms, six of the rainstorms were predicted at the accuracy rate of over 80 percent (the overall accuracy rate of the entire year was over 60 percent), thus reaching the national advanced level. On 24 June, the entire northern part of Yancheng Region experienced the worst rainstorm of the past decade (In Funing County, the total

rainfall reached 240 mm in 24 hours time); on the basis of computation results producing a timely and accurate forecast, which enabled concerned departments to take appropriate emergency measures that helped to prevent millions of yuan of damages and losses. For this, they received excellent commendations from concerned provincial departments.

In view of the excellent results of applying upper air physical quantities in weather forecasting, preparations have been made for providing even more accurate data for this year's plum rain season. Computers will play a greater role in weather forecasting.

9119
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COMPUTERS USED IN CROP DISEASE FORECASTING IN ZHEJIANG

[Article: "Zhejiang Province Achieves Preliminary Results in Using Computers for Long-Term Forecasting of Crop Diseases"]

[Text] In the past 1-2 years, the Zhejiang Computer Technology Institute has been working in coordination with Zhejiang Province Academy of Agricultural Science and Zhejiang Agricultural Department's Central Station for Tracking and Reporting Diseases and Pests in a joint project using the computer to conduct (long, medium and short term) forecasts on late rice crop disease in the province, and wheat/barley scab. Some encouraging results have been achieved. The success of long term forecasting, in particular, is of great use to agricultural production, as medium and short term forecasting can only be conducted during the middle or late growth period when the crop diseases are already beyond control and pesticides are no longer effective.

Last year, the mathematical statistical method was used in forecasting Zhenhai County's late rice crop diseases and insect pests. The computation results predicted serious calamity and the information was circulated in advance among concerned groups. It turned out that the prediction tallied with the actual disease conditions. At the end of February this year, they conducted the same computation on Jiaxing Prefecture's major and minor diseases; the results predicted light disease occurrence, which also tallied with actual conditions. Based on the long, medium and short term forecasting computation system, the Agricultural Science Institute of Jiaxing Prefecture worked in coordination with concerned crop protection departments and changed the old practice of extensively spraying "safety pesticides" by limiting the spraying area to only 220,000 mu of the entire region's 1 million odd mu, thus reducing the spray areas by 780,000 mu and cutting down the pesticide cost by over 470,000 yuan. The computer has earned the reputation of being a "good consultant" for predicting crop diseases and insect pests.

In recent years, the Institute and the Crop Protection Institute under Zhejiang Academy of Agricultural Science have expanded their late rice blast forecasting operations to 5 major prefectures and 18 counties. The computer has processed 170 years of accumulated historical information and 1.2 million data. Five comprehensive forecasting stations have been set up. The

Provincial Agriculture Department uses the computer's computation results as basis for its reports; in collaboration with the province's central station for tracking and reporting crop diseases and insect pests, it is planning to expand the wheat/barley scab disease forecasting operations to 32 counties throughout the entire province, thus allowing the computer to play a greater role in forecasting crop diseases and insect pests, open up a new path for our country's battle against crop diseases and insect pests, thereby insuring bumper harvests all year round.

9119
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COMPUTER USE IN MEDICINE EXPANDING

Chief Applications

[Article by Li Li [2621 0500]: "Computers in Medicine"]

[Text] As computer technology develops, more and more computers are being
used for surveying medical data, automatic diagnosis, and mathematical stimu-
lation of the human body. There are medium frame machines and minicomputers
designed for both specialized and general purpose digital computing, as well
as microprocessors and microcomputers. Medical computers are also known as
fixed program computers as their programs are fixed and the machines can be
directly used for processing without need for further programming. Computers
are generally good at calculating averages, correlation functions, and fast
Fourier transformation (FFT); other capabilities include: all kinds of sta-
tistical histograms, including histograms of the densities, spacings, latent
periods, peak values and amplitudes of time/nontime oriented serial/nonserial
pulses.   Special computers are characterized by such features as easy to
operate, no programming needed, high-speed operation, and ability to produce
processed data immediately, which are difficult tasks for general-use machines.

Digital computers are mostly used for automatic diagnosis, developing treatment
programs, and computing networks for storage of medical records and treatment
data.

Microprocessors are mostly used in portable monitoring units, e.g., automatic
controls for artificial arms, portable sphygmomanometers, automatic devices
for measuring electrocardiograms (ECG) and cardiac rates, electronic ears,
electronic eyes, etc.

Following are the chief applications of medical computers:

1. Processing of bioelectrical data and physiological information.

Electrocardiograms play a vital role in the diagnosis of heart diseases. To
diagnose different kinds of heart diseases, electrocardiograms are put through
pattern recognition, various discriminant functions are analyzed, Bayes formulas
are established, and electrocardiograms are automatically classified.

The digital filtering of ECG can improve the signal-to-noise ratio, condense data, save computer storage space, and accelerate operation speed. With a microcomputer, KL conversion can compress data by 12-fold.

ECG digital communication is used for transmitting ECG data of patients from remote areas or small hospitals to computer centers for data processing and instantaneous diagnosis. Portable heart monitoring devices with microprocessors can record abnormal ECG changes and store the data in cassette tapes.

Body surface His bundle electrograms and the ECG of embryos are often drowned out by noises. To obtain the required data, computers are used for computing average values of correlation functions.

The analysis of alpha-rhythms in electroencephalograms (EEG) and the computation of self-correlation functions are useful for diagnosing brain tumors. When oxygen shortage occurs in the human body, EEG variations are much more acute than ECG. Thus, it is more useful to study EEG spectrum. The use of fast Fourier transformation (FFT) can instantaneously produce the required frequency spectrum graphs. Now we already have FFT microcomputer products.

The sudden changes in cerebral electric potential caused by stimulation from sound, light or electric signals are known as induced potential, the magnitude of which amounts to only several microvolts. As there is often noise interference, the measurement of cerebral induced potential also needs computers for averaging.

With the help of computer processing of electrocochlograms (?), it is possible to perform hearing measurement objectively, thus providing otologists with valuable clinical data. Electronic cochlea devices composed of integrated circuits can help deaf patients restore their hearing sense.

The processing of electroretinograms and ophthalmodonesograms (?) are useful for diagnosing eye diseases. Electronic eyes composed of IC circuits can help patients see light again.

Computer analysis of electrohepatograms and electrogastrograms is also very valuable for studying changes in livers and stomachs.

The Fourier analysis of electromyograms (EMG) can help determine the electrical responses of muscles under such conditions as motion, injury and nerve conduction. Artificial arms controlled by microprocessors have brought hope to patients with severed limbs.

The computer processing of blood pressure, respiration, blood circulation, heart sounds, body temperature, pulses, and other life indicators is all very important for the precise diagnosis of diseases.

The measurement of human physiological parameters under special environmental conditions often requires high-speed processing of multiple parameters which can only be performed by computers. For example, to compute the physiological parameters of spacemen, airplane pilots, divers and athletes, digital

communication is used for converting the physiological parameters into pulse codes and transmitting the data through carrier waves to the receiving end for computer processing.

2. Automatic diagnosis and clinical information database

To aid doctors of both Chinese traditional medicine and Western medical practices in diagnosis and treatment of patients, computers can simulate the records of patients treated by eminent doctors, and produce diagnostic reports of certain diseases as well as recommendations for medical treatment.

With computers, it is possible to set up databases to hold such information as medical history of clinical patients, physical checkup records and laboratory test reports; such databases are helpful for data retrieval, statistical computation, group consultation, and education. Centralized monitoring units in hospital wards enable processing of data on abnormal changes at all times.

3. Image processing

By using CT scanners, it is possible to scan portions of the human body with x-rays, conduct detection through highly sensitive detectors, process the information with computers, and display the images of various sections for diagnosis. This method enables early diagnosis of diseases with considerable degree of precision, thus greatly increasing cure rates. Computers are also used for automatic cell distinguishing; cells are put through a scanning microspectrophotometer which generates a group of digitized images reflecting the light transmittance or absorptance of various portions of cells; the information is then fed into the computer for turning out statistical histograms that can be used for identifying cancer cells.

Computers can generate stereoscopic pairs based on parallax. In the study of binocular vision, it is very useful to perform fast Fourier transformation of the frequency distribution of stereoscopic pairs in space.

4. Mathematic simulation of human body organs

To simulate human body organs with computers, it is imperative to build all kinds of mathematical models, e.g., mathematical models of neurons and nerve networks, mathematical models of respiratory gas-exchange process, mathematical models of the coding, processing and transmission of messages in the sensory system, as well as mathematical models of engineering psychology, neuropathological psychology, child psychology, etc.

The computer simulation of human organs is very useful. For example, through computer simulation of spinal injuries and pathological changes, and the building of human spinal mathematical models, it is possible to study spinal responses to all kinds of external forces. Another example: Vibrations, shocks or weightlessness often cause harm to human muscles or eyesight; the cardiac-vascular system, in particular, is most susceptible to environmental force changes. With computer simulation, it is possible to predict the impact of abnormal acceleration or weightlessness on the cardiac-vascular system.

At present, linear mathematical models are used for describing the majority of life phenomena; there are a lot of problems to be solved in nonlinear model description. As computers develop, man will gradually understand the law of life.

Further Details

[Article: "News Briefs on Computer Applications in China's Medical Field"]

[Text] According to reports from the Research Society on Computerized medical Diagnosis and Treatment Systems, in recent years, many places across the country have been energetically developing computer programs based on the experiences of eminent doctors.

●The Hospital of Chinese Traditional Medicine in Heilongjiang Province plans to develop: (1) software based on Professor Gao Zhongshan's [7559 0112 1472] experiences in diagnosis and treatment; (2) software based on Professor Ma Ji's [7456 7535] experiences in diagnosis and treatment; (3) software based on Professor Han Bailing's [7281 4102 7227] experiences in diagnosing menstruation. By the end of 1980, they had compiled tables of medicines and symptoms.

●Zhejiang Medical University and Zhejiang Hospital of Chinese Traditional Medicine are coordinating their efforts in developing a program based on Pan Denglian's [3140 3397 3425] treatment of hepatitis. Based on previous case histories, Zhejiang's Medical University and the Surgical Unit of Zhejiang Hospital No 2 have jointly developed programs to identify and diagnose acute appendicitis and breast tumors. In late 1980, they also developed programs for diagnosing goiter and acute brain injuries.

●Kaifeng People's Hospital No 3 and Kaifeng Hospital of Traditional Medicine jointly developed programs for diagnosing and treating purpura due to loss of blood platelet based on the experiences of the eminent doctor of Chinese traditional medicine Zhang Nanzhi [1728 2809 3112].

●Heilongjiang Province's Zuguo [Motherland] Medical Research Center and Harbin Industrial University jointly developed a cancer treatment program based on the experiences of Zhang Qi [1728 3825], deputy director of the research center.

●Shanghai College of Chinese traditional Medicine is currently putting together a computer program for treating "dizziness" based on the experiences of Professor Jin Shoushan [6855 1108 1472], vice president of the college, and will try to complete the project in the first half of 1981. Their next project is to develop diagnostic and treatment programs based on the experiences of Professors Zhang Bousou [1728 0130 0652] and Xu Zhongchun [1776 0112 2625].

●The Academy of Chinese Traditional Medicine under the Ministry of Public Health, Beijing Hospital of Chinese Traditional Medicine and Xiehe [Union] Hospital have jointly developed (1) programs for diagnosing and treating

dysmenorrhoera based on the experiences of the eminent doctor Qian Boxuan [6929 0130 3551]; (2) program for treating diabetes based on the experiences of Zhu Shenyu [4376 3928 5280], an old doctor of Chinese traditional medicine.

●Late last year, Harbin City Hospital of Chinese Traditional Medicine developed a whole set of programs for treating pyelonephritis.

●Keifeng Hospital No 3 and Kaifeng Computer Institute jointly developed programs for diagnosing and treating coronary heart diseases based on Chinese traditional and Western medical practices, and programs for diagnosing coronary heart diseases based on Western medicine.

●Huabei Computing Technology Research Institute used a Chinese-made 183 machine for debugging two diagnostic programs developed by the Radiology Department of a general hospital: one is for identifying globular focus in the lungs, and the other is for diagnosing and identifying benign and malignant gastric ulcers.

●Shanghai City's Clinic of Chinese Traditional Medicine and Dongchang Hospital are working together on computer-aided diagnosis and treatment based on overall analysis of illness and patient's conditions in Chinese traditional medicine. They also worked on real-time processing and data processing of medical information. The machine used for these projects is a DJS051B microcomputer.

●Shanghai Hospital No 2 is developing a program for diagnosing and treating acute eye diseases based on the experiences of Lu Nanshan [7120 0589 1472], an old doctor of Chinese traditional medicine.

CANCER DIAGNOSIS SOFTWARE PACKAGE PRODUCED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 20 Nov 81 p 1

[Article: "Preliminary Results of Cancer Diagnosis Software Package"]

[Text] The incidence rate of cancer has increased in recent years. For the early diagnosis of cancer, Changzhou Radio Plant No 2 and concerned hospitals in Shanghai and Changzhou cities have jointly developed a special computerized metrological diagnosis software package for diagnosing stomach cancer, leukemia and lung cancer. The statistical approach is the principle for the development of the software. A table for computer diagnostic information was compiled from the clinical results and case summaries by experienced cancer specialists. This table is composed of symptoms and signs, which in turn can be used to differentiate cancer cases from noncancer cases. Adjustments were subsequently made by way of verification through large quantities of test and statistical data. Finally, the Bayes theorem approach, i.e., conditional probability extension, as well as fuzzy-region approximation and medical judgment were employed to determine the quantized values of various symptoms and signs, and all the information was then put through comprehensive computation and analysis, thus producing a critical limit index values for positive diagnosis of various cancers. The software program has the self-learning ability of automatically accumulating information based on diagnostic procedures and medical history. Results from preliminary tests in Shanghai and Changzhou indicate that the software can attain an accuracy of 85 percent in the diagnosis of stomach cancer and 97 percent for leukemia.

There is no doubt that the computerized system is far more convenient than other available methods for the diagnosis of cancer. It is an inexpensive means that can be extensively used in general surveys of cancer incidence in rural areas, factories, mines and other enterprises, as well as offices.

9119
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COMPUTERS USED TO PRODUCE BIORHYTHMIC GRAPHS

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 20 Nov 81 p 8

[Article: "Biorhythm Measured by Computers"]

[Text] Scientists believe that there are three separate cycles in terms of which a person's physical, emotional and intellectual energy levels rise and fall beginning on the day of birth. When a person is at the climax of physical cycle, he is full of vigor; at the peak of emotional cycle, he is cheerful and optimistic; at the top of intellectual cycle, he has quick response and good memory. Conversely, when a person is at low ebb, his physical strength is weakened; he is easily tired, feels depressed and restless, has difficulty in concentrating his thoughts, and his work performance is correspondingly downgraded.

In coordination with Hangzhou Hospital No 1, the Computer Institute of Zhejiang Provincial Scientific and Technological Commission used its computer facilities to calculate the daily pattern of physical, emotional and intellectual varia- tions, and came up with an equation for plotting biorhythmic graphs based on the Chinese ancient theory of Jingluo [main and collateral channels]. They developed a program in the BCY language on a TQ-16 computer. The program can rapidly plot biorhythmic graphs for a large group of people at different points of time. They wrote a similar program in MBASIC on a Cromemco A machine. The institute has already begun to use the computer to analyze the biorhythmic graphs of drivers in Hangzhou City's Traffic Bureau, and it has been discovered that in car accidents, the driver is usually in the critical state of extremely unstable physical and emotional conditions, and at the lowest point of intellec- tual cycle. The accuracy is amazing. The biorhythmic forecasting method is very useful for reducing traffic accidents. They also conducted analytical study of 100 patient cases in Hangzhou City Hospital No 1. The results indi- cated that 80 percent of the patients had contracted illness at the time when physiological conditions were either at a low ebb or unstable. During this particular phase, owing to the very poor emotional state, the organic immunity was greatly weakened, thus making the patients vulnerable to diseases. There were also instances of surgical complications arising at the time when the patients were in low ebb or unstable condition. All these pose an extremely important problem to the doctors, i.e., with the exception of emergency cases, surgical operations should be performed when the patients are at the peak of biorhythmic cycle.

Comrade Dai Dingkai [2071 1353 0418] of the Shanghai Semiconductor Research
Institute developed a BASIC program which can print out biorhythmic graphs
based on 23-day physical cycles, 28-day emotional cycles, 33-day intellectual
cycles (see program listing). In the program, statements 10-47 constitute the
dialog portion, i.e., the gathering of vital information through interactive
question-and-answer session between the user and the computer. Statements
50-230 compute the total number of days from the date of birth up to the
initial point of the print routine. Statements 235-970 are printing and
plotting instructions.

Program Listing:

```
LIST
 10 PRINT 'WHEN WERE YOU BORN?'
 20 INPUT Y1,M1,D1
 25 PRINT
 30 PRINT 'WHAT DATE IS TODAY?'
 40 INPUT Y2,M2,D2
 42 PRINT
 45 PRINT 'HOW MANY DAYS DO YOU WANT TO PRINT?'
 46 INPUT P
 47 PRINT
 50 LET T=(Y2-Y1)365
 60 IF Y2-Y1%4 GO TO 80
 70 LET T=T+INT((Y2-Y1)/4)
 80 DIM A(13)
 90 LET A (0)=0
100 FOR N=1 to 12
110    READ A(N)
120    DATA 31,28,31,30,31,30,31,31,30,31,30,31
125 NEXT N
130 LET S=0
135 IF M2=M1 GO TO 230
137 IF M2%M1 GO TO 190
140 FOR I=M1 to (M2-I)
150    LET S=S+A(I)
160 NEXT I
170 LET T=T+S
180 GO TO 230
190 FOR I=M2 to (M1-I)
200    LET S=S+A(I)
210 NEXT I
220 LET T=T+S
230 LET T=T+D2-D1
235 PRINT 'THE TOTAL DAYS AFTER YOU WERE BORN: ';T
360 PRINT
370 PRINT
380 PRINT
390 PRINT TAB (10); '-1';
400 PRINT TAB (30);'0';
410 PRINT TAB (50);'1';
```

```
420 PRINT
450 FOR X=5 TO 55
460  PRINT TAB(X); '-';
470 NEXT X
480 PRINT
490 FOR X=1 TO P
500    PRINT TAB(2);M2;'.';D2;
510    LET H=T
520    LET H=INT(SIN(23,14159H/23)20+30)
530    LET M=T
540    LET M=INT(SIN(23,14159M/28)20+30)
550    LET I=T
560    LET I=INT(SIN(23,14159I/33)20+30)
570    DIM B(4)
580    LET B(1)=H
590    LET B(2)=M
600    LET B(3)=I
610    LET B(4)=30
620    FOR K=1 TO 4
630      FOR L=K TO 4
640        IF B(K)%B(L) GO TO 680
650        LET Q=B(K)
660        LET B(K)=B(L)
670        LET B(K)=Q
680      NEXT L
690      IF B(K)=H GO TO 730
700      IF B(K)=M GO TO 750
710      IF B(K)=I GO TO 770
720      IF B(K)=30 GO TO 790
730      PRINT TAB(H);'H';
740      GO TO 800
750      PRINT TAB(M);'M';
760      GO TO 800
770      PRINT TAB(I);'I';
780      GO TO 800
790      PRINT TAB (30);'.';
800    NEXT K
805    PRINT
810    LET G=A(M2)
820    LET D2=D2+1
830    IF D2>Q GO TO 860
840    LET T=T+1
850    GO TO 920
860    LET D2=1
870    LET T=T+1
880    LET M2=M2+1
885    IF M2>12 GO TO 910
890    GO TO 920
910    LET M2=1
920 NEXT X
930 PRINT TAB(2);'NOTE;H-HEALTH'
```

```
940 PRINT TAB(8);'M-MANNER'
950 PRINT TAB(8);'I-INTELLIGENCE'
960 PRINT
970 END
```

Note: HEALTH - Physical cycle;
        MANNER - Emotional cycle;
        INTELLIGENCE - Intellectual cycle

9119
CSO: 4008/98

COMPUTER USE IN ENVIRONMENTAL SCIENCE

[Article by Yu Tong [5713 4827]: "Environmental Science and Computers"]

[Text] 1. Ways of Gathering Environmental Data

To gather environmental data, many monitoring network nodes have been set up in various parts of the world. In automatic monitoring, some places employ independent monitoring stations controlled by microcomputers, some places use semiautomatic offline systems tied into networks or fully automatic online systems. There are local as well as nationwide systems. The river water monitoring system in Ohio, the United States, is an offline, nonrealtime data gathering system configured with IBM1130 and peripherals, such as magnetic tape drive, disk storage, etc. PH values, oxido-reduction potentials, chloride ion concentrations, and other parameters are measured by 17 monitoring posts and transmitted to the central station via telephone lines; the information is printed and punched into cards for the computer to analyze and process. The air pollution automatic monitoring system in Frankfurt, West Germany, is configured with a supervisor computer which can automatically and continuously check and adjust testing instruments. Routine data outputs provide half-hourly mean values or daily mean values of all the parameters, as well as dynamic values of certain parameters. The parameters are also punched into paper tapes and sent to a large-frame computer which evaluates the data and produces reports on frequency distribution and excessive concentrations.

Telemetering and remote sensing techniques which are closely related to computer technology are now used in such areas as monitoring resources, water, land, vegetation, oil pollution, heat pollution, etc. for example, the United States uses a telemetering satellite for monitoring cities and energy utilization patterns, and an IBM370/158 system is used for analysis and computation.

There are many kinds of environmental data which are obtained through sampling and precise lab analysis. The use of intelligent instruments armed with microprocessors simplifies operation, reduces turnover time, and guarantees degree of precision. To achieve complete lab automation, a central computer is used for supervising the instrument operations and data gathering/processing of the entire laboratory, e.g., in the United States, the research on Delta Park (?) air monitoring network labs has further improved lab automation.

2. Prediction and Evaluation

To better predict pollution trends, it is necessary to establish pollutant diffusion models, e.g., the Air Quality Diffusion Model (AQDM) which is used for computing the average long-period concentration of surface pollutants is now employed for describing the characteristics of SO_x and suspended particulate matter. It requires such parameters as pollution sources data, meteorological data, as well as actual measurements of SO_x and particulate matter concentrations, which are input into the computer. A typical AQDM model program requires 275K of main memory, and the computation requires more than 10 hours of operational time on the IBM360/50 system. Without large capacity and high-speed computers or the required software, it is difficult to produce mathematical models of practical value.

The environmental quality index is the condensation of large volumes of primary data; it provides the basis for conducting overall evaluation of environmental quality. In Osaka's environmental quality evaluation, five pollution factors are chosen as evaluation criteria. To determine the weights, 14 variables are input into a FACOM 230-60 computer which produces comprehensive evaluation indexes.

Adequate environmental information is extremely important for making policies regarding environmental problems as well as conducting environmental research. Many countries and regions have set up environmental databases; the United Nations Environmental Planning Program also has an environmental information source retrieval system. Without computer technology, it is almost impossible to instantaneously sort, index or update such enormous volumes of data (e.g., in the United States, the National Air Data Bank had accumulated 500 million characters of data in magnetic tapes by the early 1970's), and provide users with information according to required formats. The Water Quality Control Information System (STORET) of the United States Environmental Protection Program uses an online large-capacity random access storage system for storing data from more than 10,000 different locations, covering water quality, water quality criteria, urban waste water, water areas, sea coasts, geographical locations, etc. Users can use their terminals to retrieve information from the system control computer via local or long-distance telephone lines. The database can output the water quality data in 10 different ways, such as mean values, maximum/minimum values, variance, etc. It can also plot water quality charts according to the user's format requirements.

There are quite a few successful computer applications in environmental pollution control. For example, the St. Paul Health Region Water Drainage Control System (MSSD) in Minneapolis can draw the sewage water into a purification plant, and subsequently into the Mississippi River. When the conduits are overflowed by heavy rain, the sluice gates are opened to allow the water flow directly into the river. The system employs a PDP-9 computer for polling information from various monitoring points along the river and underground conduits; the data is gathered and combined with the rainfall for analysis by the computer which formulates water routes enabling sewage water from the heaviest polluted areas to flow into the purification plants for treatment, thus minimizing pollution of the river.

Quite a few mathematical models of environmental problems have been developed and used for simulating heat growth, BOD, sewage water treatment, insect pest control, pollution forecasts, etc. For instance, microchemical models developed for studying the end result of chemical compounds dispersed in the atmosphere can be used for simulating large numbers of chemical reactions that are correlated to reaction rates; they can also be used for simulating any part of the entire process from the time when the reaction begins to the time of equilibrium. The prediction and evaluation of the environmental quality of large-scale engineering projects is of vital importance to controlling environmental quality; some commonly used models are: Reobord's (?) matrix method, overlapping method, Barter's (?) environmental influence evaluation system, and environmental pollution analytical model, etc.

Implementation program models, environmental monitoring network budgetary estimate models, environmental control impact on economy models, etc. are all used in environmental control. FORTRAN-IV and COBOL-F implementation program models can be used for evaluation air pollution control strategies. For example, based on the current status and projected growth of local drainage sources, various control plans are evaluated against predetermined air quality criteria, and the lowest cost plan is chosen among the various feasible plans. This type of program requires 10-15 hours of operation on an IBM360/40 system.

3. Conclusion

Some people contend that computer simulation technology forms one of the bases for developing environmental science in an interdisciplinary science. This argument is quite reasonable.

Everyone wants to live in a good environment, and we are all continuously striving to improve our environment. As a powerful tool, computers are bound to play a greater role.

9119
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NEW PUBLICATIONS ON COMPUTERS PUBLISHED

[Text] Microcomputer Basic Technical Manual Published

The Science Publishing House recently translated and published a manual of
basic microcomputer technology written by a well-known Japanese specialist on
microelectronics technology, Yojiro Yokoi. The manual consists of 10 chapters
which are divided into 2 major parts; the first 6 chapters deal with basic con-
cepts related to microcomputers, the basic working principles of microcomputers,
basic technical information on system storage and peripherals, and basic con-
cepts involved in microcomputer software research. The last four chapters are
devoted to various topics on Motorola's 2d generation microprocessor M6800,
i.e., basic working principles of its hardware, software characteristics of
M6800, all kinds of exercises for programming the M6800 microprocessor, and,
finally, commonly used basic programs for the M6800.

Manual of Typical DJS-131 Application Examples

The DJS-131 is a 16-bit minicomputer with comparatively good capabilities,
complete peripheral support, and relatively complete and rich library of soft-
ware. It can be configured into real time system, timesharing system and
dual-processor system; it is suitable for industrial controlling, data pro-
cessing, and scientific computation.

The 131 machine is widely used throughout the whole country. With this machine,
the following user organizations have achieved excellent economic and technical
results: Shanghai Telegraph Bureau, Shanghai Sparetime Industrial College,
Shanghai Semiconductor Research Institute, Shanghai Radio Plant Nos 7 and 14,
Huadong [East China] Electric Power Administration Bureau,and Zhengzhou Elec-
tric Power Supply Bureau. To facilitate the exchanging of experiences and
promote the popularization of the use of this model, the Shanghai Computer
Plant, with the full support of users, has compiled a book entitled "System
Capability and Application of DJS-131 Computer." The book is divided into
three major parts: (1) General Introduction; (2) DJS-131 System Capabilities;
(3) Typical Application Examples. The book is expected to be published in
October.

9119
CSO: 4008/98   - END -